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ABSTRACT

People's perceptions about others play an important role in shaping their own attitudes and behaviors, as well as social norms more broadly. This review presents a meta-analysis of the recent empirical literature that examines perceptions about others in the field. We document a number of stylized facts. Misperceptions about others are widespread, asymmetric, much larger when about out-group members, and positively associated with one's own attitudes. Experimental treatments to re-calibrate misperceptions generally work as intended; they sometimes lead to meaningful changes in behaviors, though this often occurs only immediately after the treatments. We discuss different conceptual frameworks that could explain the origin, persistence, and rigidity of misperceptions about others. We point to several directions for future research.

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I Introduction

A long literature on peer effects, social learning, and coordination has established that people are influenced by friends, peers, and other members of society. In principle, people’s *perceptions* about others should play an important role in these environments — such perceptions could in turn shape people’s own attitudes, behaviors, and social norms.

A recent and growing body of evidence has documented widespread *misperceptions* in a variety of settings. Across societies, individuals widely misperceive what others think, what others do, and even who others are. This ranges from perceptions about the size of immigrant population in a society, to perceptions of partisans’ political opinions, to perceptions of the vaccination behaviors of others in the community. This review presents a meta-analysis of the recent empirical literature that has examined (mis)perceptions about others in the field.¹ This meta-analysis aims to answer a number of questions. What do misperceptions about others typically look like? What happens if such misperceptions are re-calibrated?

We compile the recent empirical studies that elicit perceptions about others in the field. We cover 79 papers published over the past 20 years. These papers examine perceptions across a range of domains: economic topics, such as beliefs about others’ income; political topics, such as partisan beliefs; and social topics, such as beliefs on gender.

We establish a number of stylized facts. First, we document four facts on the pattern of misperceptions. (I) Misperceptions about others are widespread across domains, and they do not merely stem from measurement errors. (II) Misperceptions about others are very asymmetric, namely, beliefs are disproportionately concentrated on one side relative to the truth. (III) Misperceptions regarding in-group members are substantially smaller than those regarding out-group members. (IV) One’s own attitudes and beliefs are strongly, positively associated with (mis)perceptions about others’ attitudes and beliefs on the same issues.

Second, we present three patterns on the effects of re-calibrating misperceptions. (I) Experimental treatments to re-calibrate misperceptions generally work as intended. (II) Treatments that are qualitative and narrative in nature tend to have larger effects on correcting misperceptions. (III) While some treatments lead to important changes in behaviors, large changes in behaviors often only occur in studies that examine behavioral adjustments immediately after the interventions, suggesting a potential rigidity in the mapping between misperceptions and some behaviors.

The origin, persistence, and rigidity of misperceptions about others can in principle be explained by different conceptual frameworks, such as stereotyping (e.g., Bordalo et al. 2016), moti-

¹This means that our review does not cover the large literature on misperceptions about others in laboratory settings. Important examples of lab studies include analyses of perceptions of gender stereotypes (e.g., Bordalo et al. 2019), of voters’ beliefs of others’ behaviors in response to policy change (e.g., Dal Bó, Dal Bó and Eyster 2018), in addition to work in the context of games of public goods contribution (e.g., Fischbacher and Gächter 2010), and of altruism and dictator games (e.g., Di Tella et al. 2015). Our review also does not cover misperceptions about facts; see Nyhan (2020) for a recent review on this topic.

vated reasoning (e.g., Benabou and Tirole 2016), and pluralistic ignorance (e.g., Kuran 1997; Bursztyn, Egorov and Fiorin 2020; Bursztyn, González and Yanagizawa-Drott 2020). While this review is primarily empirical, the findings we document support these major classes of models — each would predict (several of) the key facts that we document, and most of the existing study designs do not allow one to adjudicate among these models.

We end with a discussion of important directions for future research. First, more work is needed to explicitly identify the sources of misperceptions, and examine the patterns of misperceptions more directly to rule in and rule out existing theories. The patterns that we document may also generate the need for additional theoretical frameworks on the origin of misperceptions. Second, more work is needed to understand the different ways in which misperceptions could be re-calibrated, and under what conditions such re-calibrated misperception may actually lead to behavioral changes. Third, an important direction for future research is to consider the welfare implications of widespread misperceptions and of their correction — when should misperceptions be re-calibrated, and how?

The remainder of this paper proceeds as follows. Section II describes the scope of the meta-analyses; Section III presents stylized facts on the patterns of misperceptions about others; Section IV presents stylized facts on re-calibrating such misperceptions. Section V concludes with a discussion on the potential future directions of research on this topic.

II Scope of the Meta-Analysis

We aim to select, as comprehensively as we can, papers studying people’s perceptions about others in the field that are published after 2000 and primarily in the discipline of Economics and Finance.

Specifically, we begin with a number of top journals in Economics and Finance (American Economic Review, Quarterly Journal of Economics, Journal of Political Economy, Econometrica, Review of Economic Studies, American Economic Journals, and Journal of Finance), as well as top working paper repositories (NBER, IZA, SSRN, and EconPapers). We supplement these outlets with a selected set of top journals in Political Science and Psychology (American Journal of Political Science, American Political Science Review, Political Analysis, Political Psychology, and Psychological Bulletin). We conduct keyword searches on “beliefs,” “perception,” “bias,” “misperception,” “misbelief,” “impression,” and “evaluation,” and we screen out the papers manually to zoom in on the relevant topics. We then search for keywords “field experiment,” “quasi-experiment,” and “survey” to focus on papers that examine these topics in field settings. For each paper that we select based on these criteria, we also review the work cited by the authors and supplement the list of papers to be included in the analyses. Importantly, our paper selection criteria is not explicitly and exclusively focused on misperceptions; rather, we aim to include any papers that elicit beliefs about others in the field.

Overall, this yields 79 papers that we include in the review. A subset of them, 51, are included in the primary components of the meta-analysis — this is because not all papers elicit the relevant variables needed for the meta-analysis, and not all papers provide sufficient replication data that allow us to calculate the necessary statistics. Table 1 lists the papers included in the primary components of the meta-analysis; Appendix Table A.1 provides additional details on these papers; and finally, Appendix Table A.2 lists in addition the papers included in the review but not in the meta-analysis.

These papers cover a diverse set of topics. A large group of papers focus on the domain of politics, ranging from beliefs about others’ political opinions and partisan characteristics, to beliefs about others’ political participation behaviors, to beliefs about politicians. Another large group of them falls into the broad category of socioeconomics, ranging from those that analyze beliefs about others’ income, to others’ charitable giving choices, to others’ socioeconomic characteristics such as gender and race, to stigma perceived by others regarding social programs, to others’ tax evading behaviors, to others’ expectation on inflation. Finally, a sizable body of work focuses on beliefs about others concerning topics of education, gender, immigration, and health. Appendix Table A.3 presents counts of the papers and elicited beliefs across topics.

Alongside the classification by topic domains, we can categorize papers by the types of beliefs about others that they study. Some focus on beliefs about others’ opinions and attitudes (e.g., political attitudes, gender norms); some focus on beliefs about others’ beliefs (e.g., beliefs about others’ beliefs about people using food stamps); some focus on beliefs about others’ characteristics (e.g., race, income); and some others focus on beliefs about others’ actions (e.g., voting, charitable giving, behaviors in strategic games). Appendix Table A.4 presents counts of the papers and elicited beliefs across types.

Beliefs about others can also be differentiated based on different targets groups with respect to whom the beliefs are elicited. While some papers focus on beliefs about a general population (e.g., beliefs about the racial composition of the US population), the majority of papers focus on beliefs about a specific in-group or out-group from the perspectives of the respondents. For example, Bursztyn, González and Yanagizawa-Drott (2020) focus on beliefs of men about other men’s opinions (in-group); Alesina, Miano and Stantcheva (2018) study perceptions of a native population about immigrants (out-group). A number of papers contrast beliefs about in-groups and out-groups. For example, Graham, Nosek and Haidt (2012) measure perceptions of Democrats and Republicans about their respective in-groups’ and out-groups’ political opinions. Appendix Table A.5 presents counts of the papers and elicited beliefs by targets.

Moreover, we note that the papers we review represent a variety of methods in eliciting beliefs about others. One dimension of methods relates to incentives for reporting perceptions accurately and truthfully. Certain papers elicit perception in an incentivized manner. For example, Cantoni et al. (2019) incentivize the elicitation of beliefs, rewarding respondents if their reported beliefs are within a certain range around the truth. Other papers refrain from incentivizing their belief

Table 1: Overview of papers included in the meta-analyses

Label	Context	Primary beliefs	Treatment
A-14	voters in California	partisan differences in political opinions	no
ABL-20	parents in Zambia	daughter's ability and behavior	yes
AMR-21	households in Mozambique	support for social distancing during COVID-19 pandemic	yes
AMS-18	non-immigrants in European countries and US	immigrants' characteristics	yes
AMS-21	university staff members in Ethiopia	female and male leader's ability	yes
AR-21	US representative sample	stigma about food stamps	yes
AS-18	a sample of US population	party-stereotypical characteristics	no
BC-12	poor families in Brazil	high school and college graduate wages	no
BCG-16	self-identified liberals and conservatives in the US	partisan differences in political opinions	no
BFP-18	married couples in India	gender norms on women working	no
BGY-20	married young men in Saudi Arabia	women working outside of home	yes
BLP-20	taxpayers in Uruguay	tax evasion behavior	no
BPT-20	senior medical students in the US	position in the income distribution	yes
BS-18	state legislative candidates in the US	public opinion about political issues	no
BTY-20	self-identified liberals and conservatives in the US	partisan differences in political opinions	no
CGK-21	firm managers in New Zealand	inflation expectations	yes
CH-21	US representative sample	probability for voting for Trump	yes
CPT-13	households in Argentina	share of low income population	no
CPT-18	employees at a Southeast Asian corporation	peers' and manager's salary	no
CYY-17	students at an university in Hong Kong	anti-authoritarian attitudes	no
CYY-19	students at an university in Hong Kong	protest participations	yes
DM-21	US sample	donations	yes
DR-19	households in Malawi	child's school performance	yes
F-18	students at an university in California	present bias	no
FHW-15	a sample of villagers in Liberia	project contribution	yes

Label	Context	Primary beliefs	Treatment
FM-04	university students in Switzerland	donations	yes
FMP-19	Germany representative sample	position in the income distribution	yes
GHM-20	US representative sample	closeness of elections, voting for Democratic or Republican governor	yes
GNH-12	US online sample	partisan moral values	no
GRU-20	US online sample	immigrants' characteristics	yes
HFM-19	senior legislative staff in the US	constituents' political opinions	yes
HHH-19	party supporters in a Western European country	canvassing behavior during election campaign	yes
HNO-20	CEOs and non-CEOs in China	CEOs' and non-CEOs' strategic decisions	yes
HSC-18	non-Hispanic Americans	size of immigrant population	yes
JO-09	women in five Indian states	women's status: acceptability of husband beating his wife	yes
JO-20	Denmark representative sample	immigrant's characteristics	yes
K-21	parents in Sierra Leone	child vaccination	yes
KNT-15	voters in Italy	politicians' ideology and competence	yes
KP-21	US representative sample of parents	child's skills reading and math skills	no
LM-16	US representative sample	partisan differences in political opinions	no
LMB-13	male students at a US university	hand washing behavior	yes
LPR-20	taxpayers in Peru	donation	yes
LS-14	US sample	population characteristics	yes
MT-19	Chinese and US samples	climate change: beliefs and policy opinions	no
N-18	US representative sample	global income distribution	yes
RF-18	high-risk students in the US	child's school absences	yes
RLD-18	parents in school districts on the US West Coast	child's school absences	yes
TS-18	students at a US university	students' mental health	yes
W-20	US representative sample	Muslims' patriotism; attitudes towards Muslims	yes
WZ-15	students at a US university	income depending on gender and college major	yes
Y-19	Mozambique representative sample	HIV stigma	yes

elicitation. Appendix Table A.6 presents counts of the papers and elicited beliefs depending on whether the elicitation involves incentives. A second dimension of methods concerns the units of measure of the perception. Many papers measure perceptions about shares, e.g., perceptions about the share of people with a certain characteristic, agreeing with a statement, or taking an action. Another set of papers measures perceptions as absolute values, e.g., perceptions about others' (average) political opinions on ordinal scales or others' income. A few papers measure perceptions as binary indicators. For example, Kinsler and Pavan (2021) study beliefs regarding whether children's school performance is above average. We will examine whether patterns of beliefs about others depend systematically on the methods of the underlying belief elicitation. Appendix Table A.7 presents counts of the papers and elicited beliefs by units of measure.

Finally, the examined papers use various methods to assess changes in beliefs about others. A substantial share of papers implement experimental treatments explicitly aimed at changing respondents' beliefs about others (as indicated by the last column in Table 1, and which are explicitly reviewed in Section IV). The experimental designs vary across papers, ranging from eliciting beliefs both before and after the treatment (thus allowing for within-subject comparisons), to only eliciting beliefs after the treatment for the treated subjects (thus being constrained to between-subject comparisons) potentially to mitigate anchoring and other unintended effects. While a number of papers aim to use experimental treatments to study the effects of belief manipulation about others on downstream behaviors, several studies focus exclusively on the effects on beliefs themselves (e.g., Jørgensen and Osmundsen (2020) study how information provision about non-Western immigrants' welfare dependency rate, crime rate, and population share affects respondents' opinions about immigrants; Jensen and Oster (2009) study how the access to cable TV changes women's acceptability of domestic violence). Appendix Table A.8 presents counts of the papers that involve treatment interventions, and Appendix Table A.9 presents counts depending on whether beliefs are elicited before and/or after the treatments.

Beliefs are the unit of analyses in our meta-analysis, and we aim to achieve balanced representation of papers. Our meta-analysis includes comparable numbers of studies for each major topic of beliefs about others. However, the number of beliefs differs substantially across types. For example, papers on beliefs about others' opinions elicit many more beliefs than papers on beliefs about others' characteristics and actions. We distinguish primary and secondary beliefs for each paper based on its focus, and restrict the main analyses just to the primary beliefs in cases that multiple beliefs are elicited in the paper. The stylized facts that we present remain unchanged if we include secondary beliefs to the analyses as well (see Appendix Figures A.1-A.3).

III Patterns on Misperceptions about Others

III.A Misperceptions about others are widespread

We begin by examining the prevalence of misperceptions about others across the papers in which beliefs about others are elicited.

We define the main measure of (mis)perceptions based on the distribution of perceptions relative to the true value: share of correct beliefs, allowing for a range of 0.5 standard deviations around the truth for noise. This measure provides a harmonized metric of misperceptions across papers, in particular given the diverse ways in which beliefs about others are elicited as described in Section II. Such measure does not depend on the specific directions with which beliefs about others are measured. For example, when eliciting beliefs about others' support for universal health care, survey questions may ask about the share of population with high support, or low support. Neither does this measure of misperceptions depend on the unit of measurement. For example, some studies elicit beliefs regarding the shares of the population, and others elicit beliefs regarding the absolute size of certain groups. Alternative measures of misperceptions using different ranges around the truth yield results very similar to what we will describe next (see Appendix Figure A.4).

Note that this measure of misperceptions requires that perceptions about others are elicited and the corresponding truth is known. The truth can be either of an objective or a subjective nature. For example, perceptions of a population's racial composition have an objective truth, i.e., the population shares of each race groups as reported in census data. For perceptions of other people's opinions, the truth refers to the relevant populations' reported opinions (e.g., the average level of the opinions). These requirements limit the perceptions included in the analyses to those with a measurable and measured truth.

Figure 1 presents the distribution of the share of respondents holding correct perceptions across the primary beliefs about others elicited in the papers. The papers (and their primary beliefs) are ordered in descending fashion with respect to the share of respondents holding correct perceptions about others. One can see that the misperceptions about others are prevalent and generally large in magnitudes. In only 20% of the beliefs, the share of respondents who hold correct perceptions about others (i.e., within 0.5 standard deviation of the truth) exceeds 50%. In more than 30% of the beliefs, more than three quarters of the respondents hold beliefs that are at least 0.5 standard deviation away from the truth.²

It is important to note that misperceptions about others are prevalent among the papers, despite the fact that misperception is not an explicit criterion for papers' inclusion. Papers are included in our analyses as long as they elicit beliefs about others. This could be reflecting the

²Interestingly, for a few belief dimensions, the share of respondents holding correct perceptions are high and even close to 100% — these are primarily perceptions about others' income, of which the truth has large standard deviations and thus our baseline correct perception metric becomes very conservative.

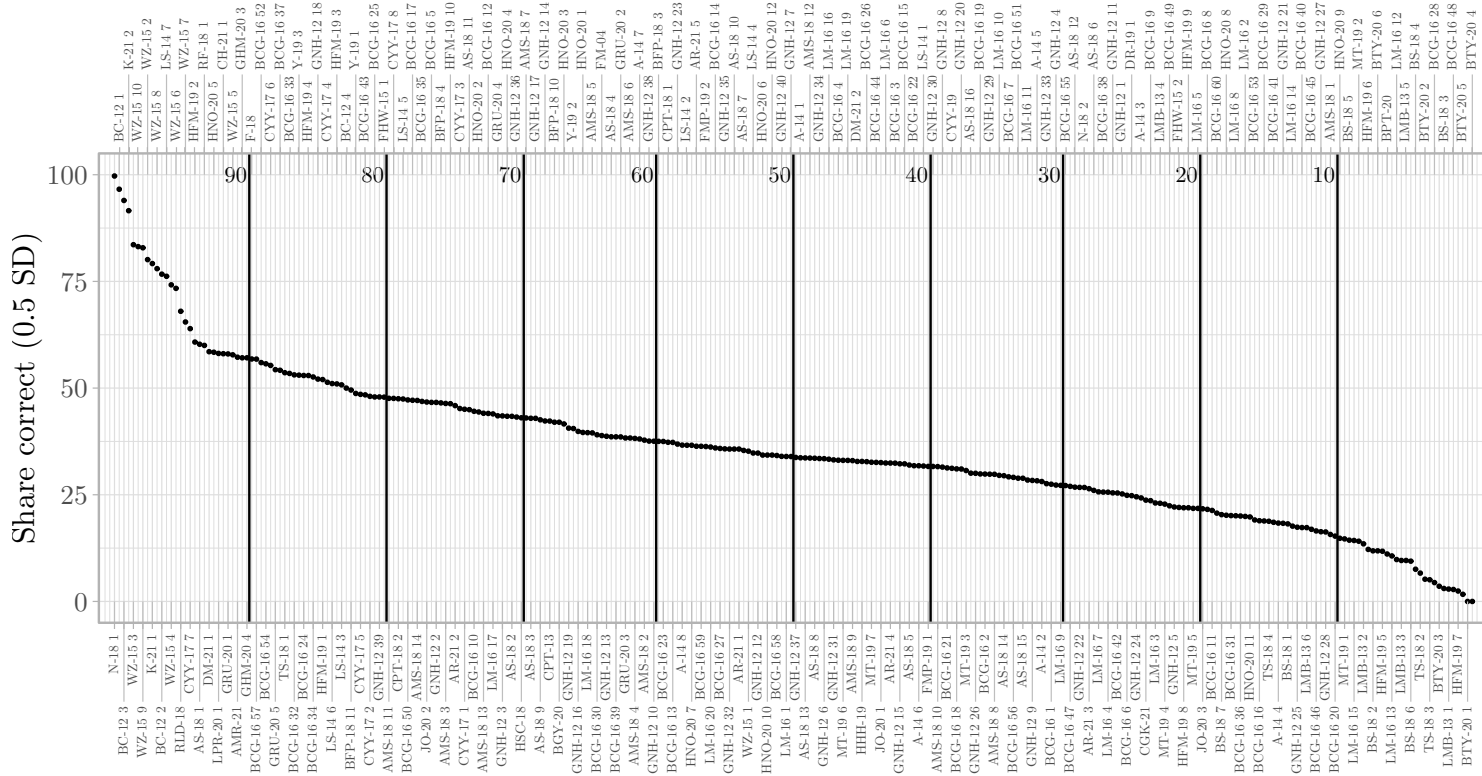


Figure 1: The figure shows the distribution of misperceptions across papers. We measure misperceptions as the share of perceptions within 0.5 SD of the truth. Vertical lines indicate deciles.

genuine phenomenon that misperception is widespread. However, it is also likely that the published papers are implicitly selected on documenting misperceptions: it is difficult to speculate whether the domains that are not covered by the existing literature may exhibit similar patterns of widespread misperception as we observe, or that the domains where misperceptions are prevalent are saliently focused by researchers and published works. While many important domains have already been studied by the current literature, more work is needed to explore whether there exist clusters of beliefs that are well calibrated among the population.

Another important aspect of the interpretation of misperceptions patterns is that our analyses, similarly to what is done by the vast majority of the work in the literature, take the distribution of the respondents' own characteristics, attitudes, preferences, beliefs, and actions as the truth. Accordingly, beliefs about others deviating from such truth are considered misperceptions. While this is uncontroversial when the truth is objective (e.g., beliefs about the population's demographic characteristics), at least in some domains where stigma and social desirability biases are extensive, respondents' answers about others may be more reflective of the truth than their own stated answers. Several works explicitly deal with issues related to stigma and social desirability biases that may affect survey responses and find that this is not a primary concern (e.g., Bursztyn, González and Yanagizawa-Drott 2020, Cantoni et al. 2019), but others have found it to be relevant for particular contexts such as social distancing behaviors during the COVID-19 pandemic (Allen et al., 2021).

III.B Misperceptions are not merely measurement error

Given the prevalence of misperceptions documented by the existing literature, one naturally wonders whether the elicited misperceptions may simply be noises when respondents report their perceptions about others. Note that our baseline measure of the proportion of respondents holding incorrect beliefs already account for answers reasonable close to the truth that may be due to measurement errors.³

We provide two more pieces of evidence from the meta-analyses to support that the prevalent misperceptions about others documented in the literature are not merely measurement errors. First, we examine whether the share of respondents holding correct beliefs (again, allowing for a window of error of 0.5 standard deviation around truth) is associated with the underlying level of the truth. When the truth is elicited in absolute level, we transform it into a percentage scale relative to the range of feasible values (the minimum and maximum possible values for beliefs with a finite minimum and maximum). For beliefs with an infinite minimum or maximum (e.g., beliefs about the global average income), we limit the range to a reasonable value set as the maximum belief excluding outliers in the data. Figure 2 plots the share of respondents holding correct beliefs against the corresponding truth in context of any given study. Apart from the cluster of

³We also find that the share of respondents holding correct perceptions are uncorrelated with the number of observations in the study (p-value = 0.478).

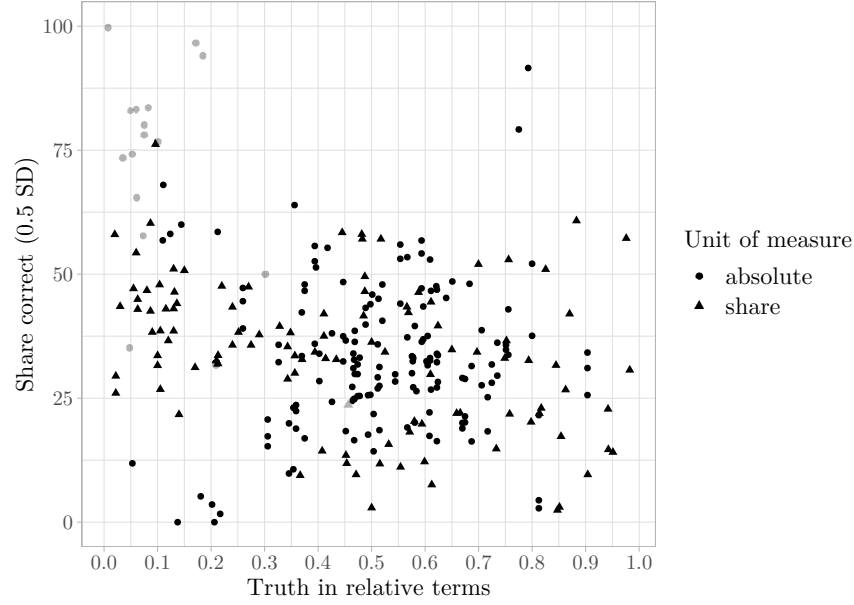


Figure 2: This figure shows the share of correct perceptions (allowing for 0.5 SD around the truth) and the truth in relative terms. For perceptions with an infinite range of possible values, we restrict the scale by defining a reasonable maximum (i.e., the maximum reported perception that is not clearly an outlier) — these beliefs are represented by the grey dots.

studies that focus on beliefs about others’ income where the truth levels are low in relative terms (in grey circles), one does not observe overt patterns between the level of misperceptions and the underlying truth levels. In particular, there is no evidence that the share of respondents reporting correct beliefs about others significantly increases when the truth is around midpoint of the distribution, due to reasons such as survey respondents’ inattention or cognitive uncertainty (Enke and Graeber, 2020).⁴

Second, we find that the methods in which beliefs about others are elicited do not affect the magnitude of misperceptions. In particular, we do not observe the share of respondents holding incorrect beliefs to systematically depend on whether beliefs about others are elicited in relative terms (e.g., as percentage; studies following these methods are marked as triangle in Figure 2) or in absolute levels (marked as circles). In Appendix Figure A.5, we also show that the share of respondents holding incorrect beliefs is not systematically related to whether beliefs elicitation is incentivized. These patterns suggest that the elicited beliefs about others and the corresponding degree of misperceptions are unlikely to be driven by artifacts of specific measurement choices and the differential levels of measurement errors associated with these methods.

Taken together, these patterns indicate that the misperceptions about others exhibited across papers in the recent literature likely reflect genuine, meaningful discrepancies between respon-

⁴In a few studies that elicit respondents confidence in their reported perceptions (Nair, 2018; Fehr, Mollerstrom and Perez-Truglia, 2019; Bursztyn, González and Yanagizawa-Drott, 2020), those who are more confident are indeed more likely to hold correct perceptions about others.

dents beliefs about others and reality. The patterns of misperceptions that we will describe in the following sections, such as the shape of their distributions in Section III.C, also suggest that symmetric noises in general are unable to account for the observed misperceptions. Moreover, the fact that in most papers, respondents' beliefs about others are strongly associated with behaviors and other related attitudes suggest that the elicited misperceptions are in general capturing meaningful variations across people. It is thus worth understanding the causes and consequences of such misperceptions.

III.C Misperceptions about others are very asymmetric

We next examine the patterns of misperceptions about others, focusing first on the distribution of beliefs underlying such misperception. Are incorrect beliefs that constitute the misperceptions about others symmetrically distributed around the truth?

We define asymmetry of misperceptions as the ratio between the share of respondents on one side of the truth and that on the other side. We always take the larger share as the numerator, and the smaller share as the denominator, regardless of whether the corresponding beliefs are underestimating or overestimating the truth. Thus, a ratio equals to 1 indicates exact symmetry, and the higher the ratio, the larger is the underlying asymmetry. Such measure of asymmetry does not require one to take a directional stance regarding overestimating and underestimating relative to the truth, preventing potential confusion caused by different phrasing of belief across papers. For example, the asymmetry measure remains unchanged no matter if the perception of a political opinion is phrased such that overestimation refers to a more liberal or conservative position.

Figure 3 presents the distribution of asymmetry of misperceptions across papers, where vertical lines split the asymmetry distributions into deciles. The top decile is presented in a separate panel due to the scaling. Overall, misperceptions about others are asymmetrically distributed, and such asymmetry is large in magnitude. In fact, only about 10% of the papers find misperceptions about others symmetrically distributed around truth, namely, with approximately equal share of respondents holding beliefs above and below the truth. About 80% of the papers find misperceptions with asymmetry measure greater than 1.5, that is, respondents fall on one side of the truth is greater than the other side by at least 50%; and for more than half of the papers, the asymmetry measure is greater than 2.5, namely, respondents fall on one side of the truth is greater than the other side by at least 150%. This pattern of asymmetry is robust to alternative measures: for example, we omit correct perceptions (again allowing for different ranges around the truth as in section III.A) when constructing the asymmetry ratios, and the results are presented in Appendix Figure A.6.

The prevalence of asymmetry in misperceptions are unlikely to be driven by any implicit selection in papers' publications. While many papers feature misperceptions, most papers that we examine do not explicitly mention the asymmetry of such misperception.

What may account for such prevalence of asymmetry in misperceptions about others? One

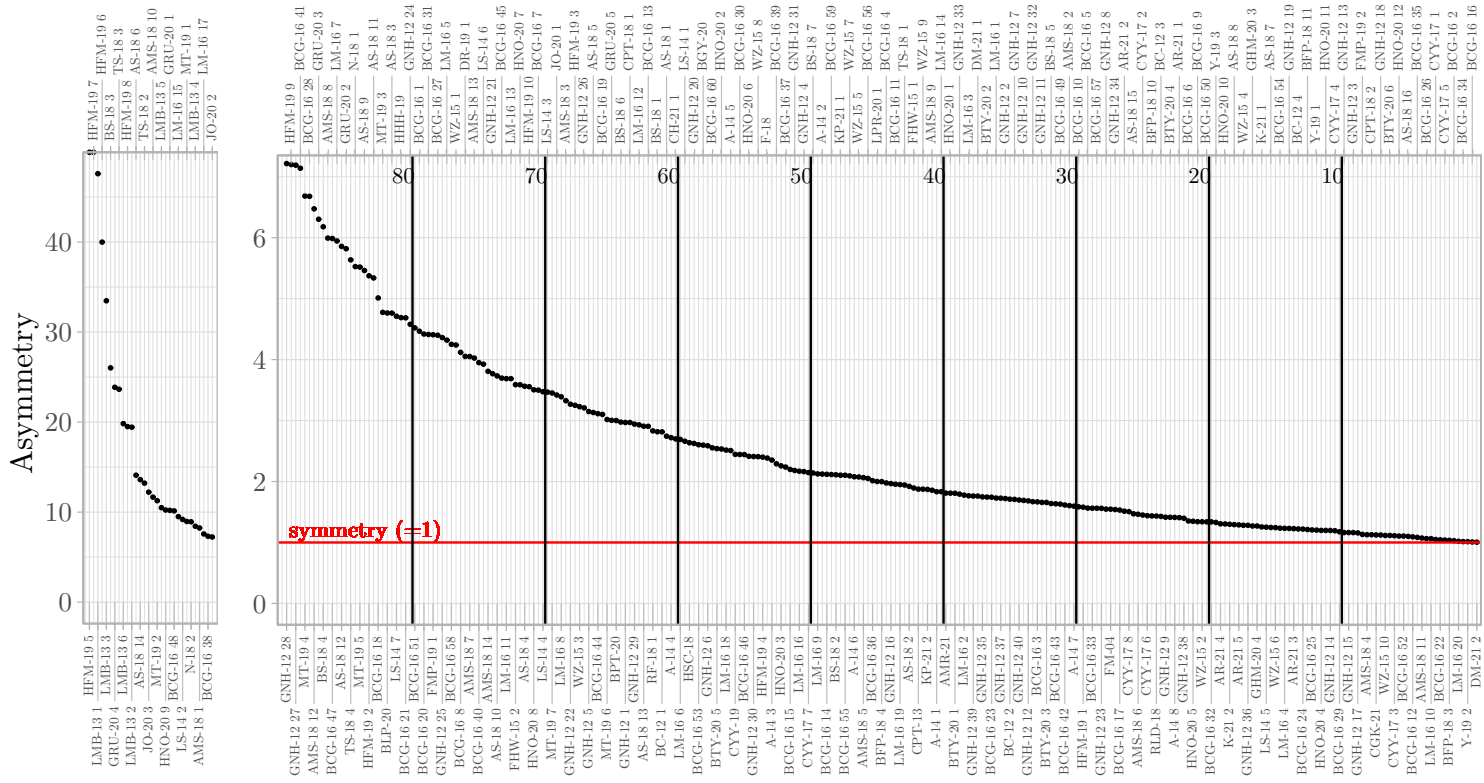


Figure 3: This figure shows the distribution of asymmetry across papers. Asymmetry is defined as the ration of underestimates to overestimates using the larger share as the numerator and the smaller share as the denominator. Vertical lines indicate deciles.

may suspect that such asymmetry may mechanically appear when truth moves away from the midpoint of the scale. For example, there may be greater asymmetry in misperceptions if the truth is 80% than the case if the truth is 50%. However, we find that asymmetry in misperceptions is not merely a result of the underlying magnitude of truth — the degree of asymmetry is largely uncorrelated with where truth stands along the distribution (see Appendix Figure A.7).⁵

A number of demand-side mechanisms emphasized in the literature could generate systematic asymmetry in misperceptions about others. They include: (i) stereotyping, where beliefs are systematically shifted towards the direction that are more representative in the tail likelihood (e.g., Bordalo et al. 2016); (ii) projection bias, when one's own attitudes are asymmetrically distributed, then perceptions about others projected from one's own attitudes would be asymmetric as well (e.g., Madarász 2012; see Robbins and Krueger 2005 for a review in the social psychology literature on this topic);⁶ and (iii) pluralistic ignorance, in particular due to social stigma and political pressure — if such stigma and pressure concern expressions of attitudes in one particular direction, the resulting misperceptions about others due to pluralistic ignorance could become asymmetrically concentrated toward that direction as well (e.g., Bursztyn, Egorov and Fiorin 2020; Bursztyn, González and Yanagizawa-Drott 2020; Braghieri 2021). Note that while the mechanism of stereotyping could result in asymmetry in misperceptions about others under all circumstances, other mechanisms described above would generate asymmetry only under certain conditions.

Important supply-side factors could also contribute to the asymmetric misperceptions that we observe across papers, and this may be especially relevant in the domain of politics.⁷ The average biases and slant in media on both sides of the political spectrum may not cancel each other out in aggregate, and the asymmetric misperceptions about others among the citizens could reflect the underlying supply-side asymmetry in media content. In particular, media on one side of the political spectrum might be particularly effective in affecting audience's beliefs about others, and hence resulting in the overall asymmetry in voters' misperceptions. It is also important to note that such asymmetric media landscape might also interact with the demand-side forces discussed above, which could in turn further foster asymmetric misperceptions. A particularly salient environment where demand-side and supply-side forces intersect is social media, where studies have shown that content exposures could substantially affect individuals' views towards others (Allcott et al., 2020; Bursztyn et al., 2020; Levy, 2021). Disentangling these mechanisms on both the demand and supply side, and understanding how they interact would be an important direction for future research.

⁵Most studies do not feature elicitation of misperceptions along multiple directions. In Alesina, Miano and Stantcheva (2018), perceptions of the prevalence of both highly educated and lowly educated immigrants are elicited; one observes asymmetry with many more respondents under-estimate immigrants' education level regardless of the ways the questions are asked.

⁶Motivated reasoning could complement projection bias under certain circumstances, for example, when the beliefs that others are similar to oneself provides additional utility.

⁷A large literature in economics and political science has devoted to studying the impact of media biases on citizens' political beliefs and behaviors, and we cannot do justice to survey this vast literature here.

III.D Misperceptions about in-groups are substantially smaller than those about out-groups

We next examine whether patterns of misperceptions about others differ depending on whether the targets of the beliefs are in-group or out-group members of the respondents' social group.

In order to capture the difference between groups and not confound it with differences across dimensions of misperceptions, we compare misperceptions regarding in-group members and those regarding out-group members within a particular belief dimension. For example, we compare the perceptions of Democrats about other Democrats' (in-group) and Republicans' (out-group) political opinions. This requires studies to elicit both in-group and out-group perceptions, and the analyses in this section are thus limited to the following papers: Ahler and Sood (2018); Ahler (2014); Cullen and Perez-Truglia (2018); Mildenerger and Tingley (2019); Levendusky and Malhotra (2016); Bordalo et al. (2016); Graham, Nosek and Haidt (2012); Wiswall and Zafar (2015). This set of papers is concentrated in the domain of politics: 5 of them cover perceptions of Democrats and Republicans about each other.

Figure 4 presents the comparisons between misperceptions about in-group members and those about out-group members. We focus on three aspects of such comparisons: (i) the size of misperceptions, measured as the share of respondents holding correct perceptions about others, using the metric described in Section III.A (Panel A); (ii) the spread and variation in perceptions about others, measured by the standard deviation of the corresponding perceptions (Panel B); and (iii) the asymmetry of perceptions, measured by the ratio of respondents fall on either side of truth, using the metric described in Section III.C (Panel C). Along each of these three aspects, we plot the in-group vs. out-group differences: a positive number in Panel A, for example, would indicate a higher share of respondents holding correct beliefs about in-group members than about out-group members along the same belief dimension.

We observe that perceptions about in-group members are systematically better calibrated, less disperse, and less asymmetric. Among more than half of the belief dimensions, more respondents hold correct beliefs about their in-group members than about out-group members. Moreover, beliefs about out-group members tend to exhibit greater spread across respondents than that about in-group members, suggesting that perceptions about in-group members are not only more accurately calibrated on average, but also more tightly calibrated around the truth. Finally, we find that perceptions about in-group members are much more symmetrically distributed around the truth, than that about out-group members. Intriguingly, we do not observe an obvious pattern between the differences in average in-group vs. out-group misperceptions and the differences in their spread. On the other hand, the greater the in-group vs. out-group differences in shares of respondents holding correct perceptions, the bigger is the differences in the underlying asymmetry in the perceptions. Appendix Figure A.8 plots the correlations across in-group vs. out-group differences in average misperceptions, the spread of beliefs, and asymmetry of the misperceptions.

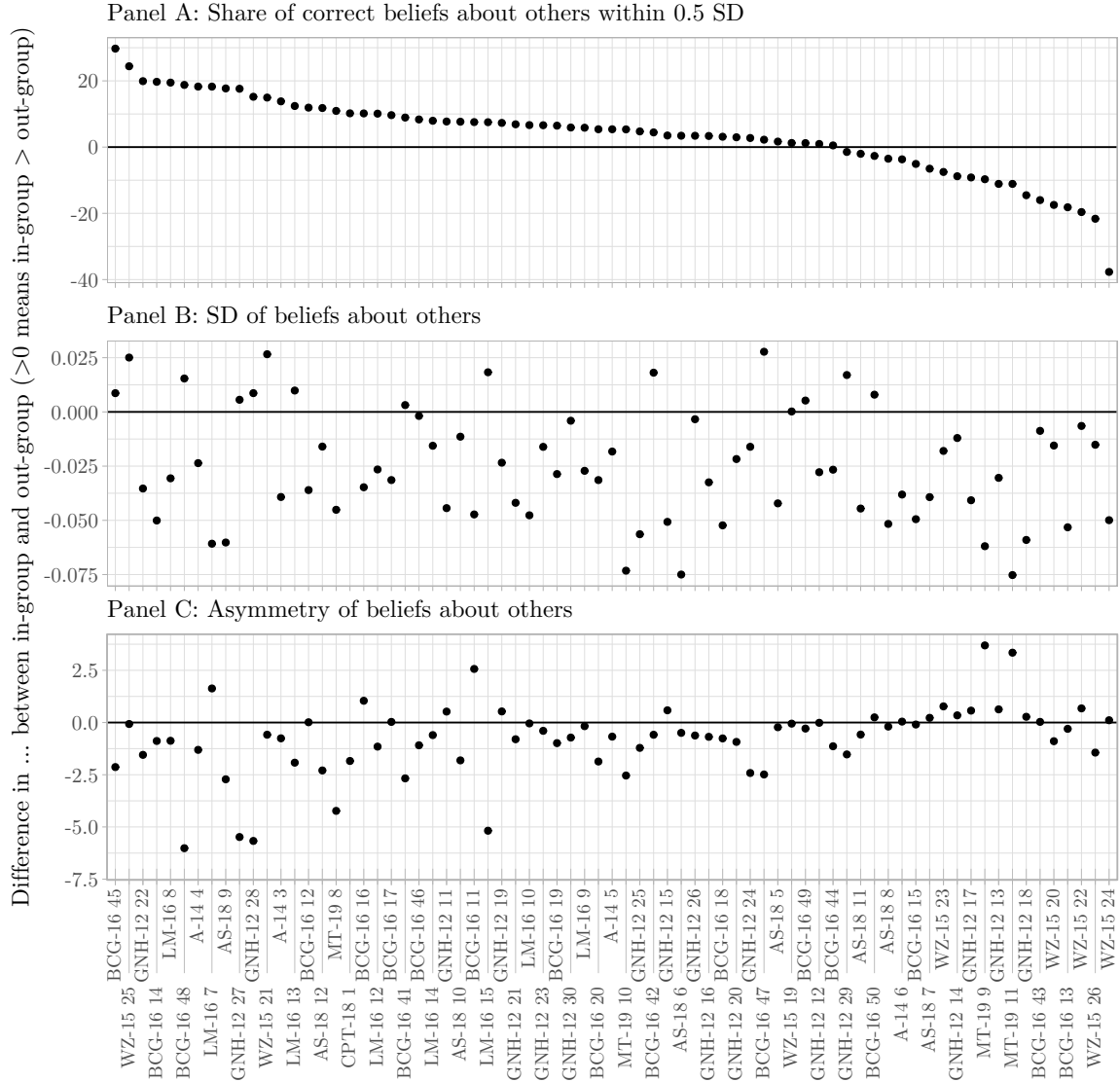


Figure 4: This figure displays the difference between perceptions about in-group and out-group. Panel A shows the share of beliefs within 0.5 SD of the truth. Panel B shows the standard deviations of beliefs re-scaled by the possible values. Panel C shows asymmetry, defined as the ratio of underestimates to overestimates (using the larger share as the numerator and the smaller share as the denominator).

Depending on the mechanisms that drive the differences in perceptions between in-group and out-group members, distinct avenues may be effective in reducing the misperceptions. If the misperceptions about others, especially when the target of inference are out-group members, are driven by (rational) inattention, then direct information provision could be effective in reducing the misperceptions. To the extent that social interactions are much more abundant among in-group members than out-group members due to segregation, homophily in social networks, or online filter bubbles (e.g., Gentzkow and Shapiro 2011; Glaeser 2005), inducing greater social contact with

and consumption of information regarding out-group members may serve to mitigate misperceptions (e.g., Bursztyn et al. 2021; Schindler and Westcott 2021). However, simply increasing social interactions may not be effective and could even generate backlash, if perceptions about out-group members are associated with identity-based motives (e.g., Bonomi, Gennaioli and Tabellini 2021) and affective politics (e.g., Iyengar et al. 2019). Furthermore, the very concept of in-group and out-group may be endogenously determined, based on factors such as individuals' immediate surroundings, changes in the presence of "outsiders," and the socioeconomic or cultural dimensions on which identity is determined. Current research does not provide sufficient empirical evidence to distinguish among the mechanisms underlying in-group vs. out-group differences in misperceptions: this is an important direction for future research.

III.E Attitudes/beliefs of oneself are strongly, positively associated with misperceptions about others

Finally, we examine whether misperceptions about others are systematically associated with one's own attitudes, beliefs, and behaviors. For example, is one's own opinion about a certain policy correlated with the perception of others' opinion about that same policy?

We focus on papers that report both perceptions about others (characteristics, attitudes, beliefs, and behaviors) and the corresponding characteristic, attitudes, beliefs, and behaviors of the respondents themselves. This limits the sample used for this exercise to 17 papers. To get a measure of correlation that is comparable across papers, we standardize both the perception and the own characteristic and calculate the correlation between the standardized measures.

For each dimension of the perceptions about others, we regress that on the corresponding characteristics, attitudes, beliefs, or behaviors of the respondents themselves. Figure 5 presents the correlation coefficients, as well as the 95% confidence interval of the estimates. In the majority of the papers and the beliefs that they elicit, we observe that attitudes, beliefs, and behaviors of one's own are strongly and positively associated with one's beliefs about others in the same dimension.

We then distinguish if this pattern differs depending on whether the perceptions concern in-group or out-group members. We use the same classification criteria as described in Section III.D. For papers that only elicit beliefs about one group, we judge whether the targets of the beliefs are about the general population of concerns given the scope of the paper (e.g., perceived share of people in Uruguay evading taxes, as in Bergolo et al. (2020)), or about members who share characteristics with the respondents (e.g., men's perceptions of other men's support for women working outside the home, as in Bursztyn, González and Yanagizawa-Drott (2020)). Correlation coefficients on perceptions about in-group members are marked in darker grey in Figure 5, and those about out-group members are marked in lighter grey. We observe that when perceptions are concern out-group members, the correlation between one's own attitudes, beliefs, and behaviors,

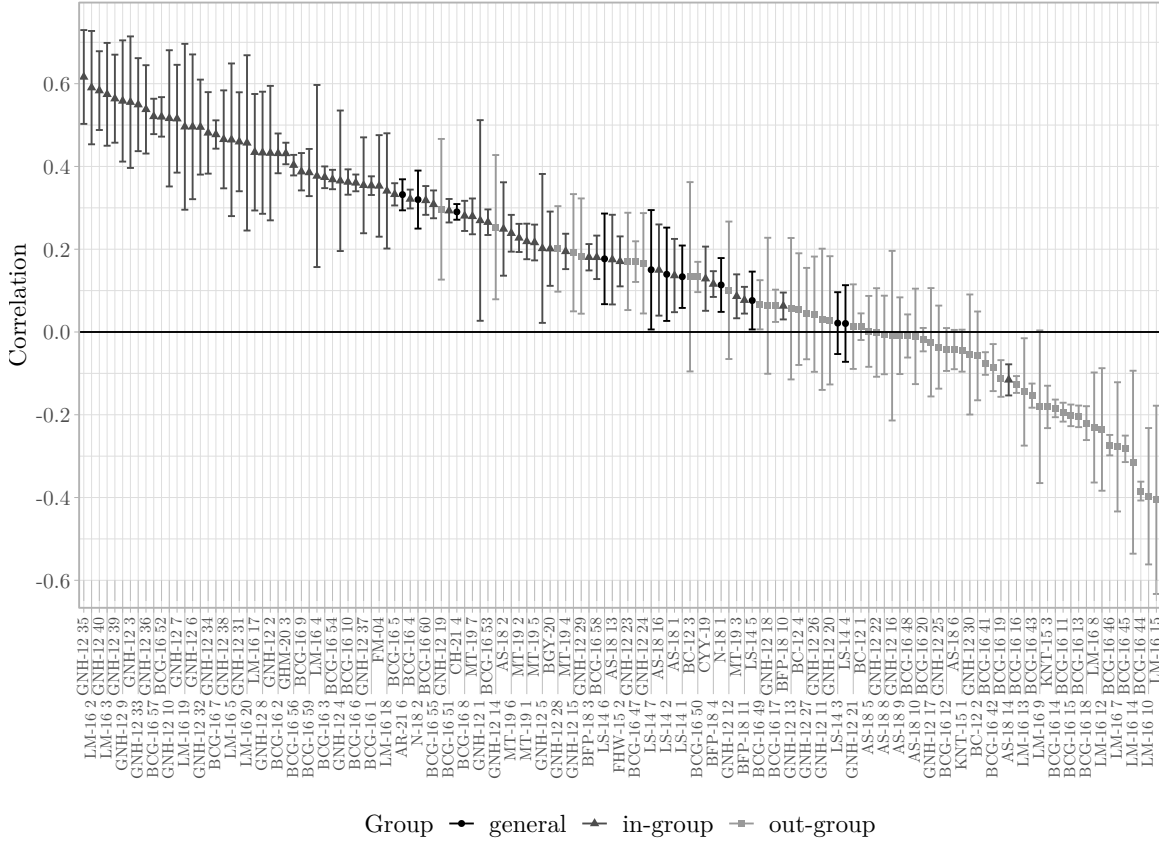


Figure 5: This figure shows the correlation between perceptions about others' characteristics/opinions/actions and one's own characteristics/opinions/actions (both standardized) with 95% confidence intervals based on robust standard errors. Different color represent perceptions about one's in-group, out-group, or general population.

and the corresponding perceptions about others turn significantly negative.

Taken together, these patterns indicate that respondents overwhelmingly tend to think that other in-group members share their characteristics, attitudes, beliefs, or behaviors, while those in the out-groups are opposite of themselves.

Several mechanisms could account for the patterns observed here. Projection bias in general (e.g., Madarász 2012), and curse of knowledge in particular (e.g., Camerer, Loewenstein and Weber 1989), would predict a strong correlation between one's own attitudes, beliefs, and behaviors, and the corresponding beliefs on others. Note that the most generic form of projection bias would not be able to account for the opposite patterns between beliefs about in-group and out-group members. Another mechanism that is consistent with these patterns is motivated reasoning. Beliefs about others could become associated with one's own attitudes when one derives utility from holding specific beliefs about others: positive utility from holding beliefs that in-group members are aligned with one's own attitudes and preferences, and out-group members are opposite of

one's own (e.g., Bonomi, Gennaioli and Tabellini 2021).

By presenting the correlation coefficients, we do not take a stance (and neither does much of the existing literature) on the direction of causation. Mechanisms such as projection bias and motivated reasoning imply that one's own attitudes and beliefs shape one's beliefs about others. Uncertainty derived from the same sources may generate the positive correlation we observe. It is also likely that beliefs about others, at least in part, feed back to shape one's own beliefs and attitudes. For example, perceptions about others could provide signals that generate conformity (e.g., by informing about the prevailing social norm), and induce social learning (e.g., about the underlying state of the world). Distinguishing the direction of causality underlying the relationships we document here is an interesting and important direction for future research.

IV Patterns on Re-Calibrating Misperceptions about Others

An important component of the existing literature has been the study of whether experimental treatments can affect misperceptions about others, and the consequences of re-calibrated perceptions about others.⁸ Zooming in on the experimental components, we document some key stylized facts on re-calibrating misperceptions about others.

The typical design to re-calibrate misperceptions about others in the existing literature is to provide respondents with (truthful) information about others.⁹ These experimental treatments rely on the logic that a crucial source of misperceptions about others is that people possess biased or insufficient information; thus, information provision may meaningfully affect perceptions about others.

From the perspective of experimental structure, the existing studies generally features two designs. The first type of design elicits beliefs both prior to and after the experimental treatment among the treated subjects. Some studies re-elicite beliefs among the control group subjects as well (sometimes after a placebo treatment), while others skip the posterior belief elicitation among the control group and rely on the assumption that control group subjects' beliefs do not change during the relevant time frame. This type of experimental design allows one to conduct within-subject analyses on the treatment effects, which could substantially increase statistical power. More importantly, such design allows for the same information treatment to have heterogeneous effects depending on subjects' prior beliefs (and the positions of such prior beliefs relative to the information provided). A second type of experimental design elicits just one round of beliefs. For treated subjects, belief elicitation occurs after the experimental treatments and hence measures posterior beliefs. This design requires the analyses to be conducted across subjects. While typically more power demanding and less flexible in incorporating treatment effects heterogeneity, cross-subject

⁸Several studies analyze experimental treatments that may have affected perceptions of others, most notably the treatments that aim to change social norms (e.g., Allcott 2011). These studies are not included in the meta-analysis here if they do not explicitly elicit perceptions about others.

⁹See Haaland, Roth and Wohlfart 2020 for a review on the methodology of information treatments in general.

designs may reduce concerns on anchoring due to multiple rounds of belief elicitation, and may also alleviate, at least in part, concerns over experimenters' demand effect.

IV.A Treatment to re-calibrate misperceptions generally works

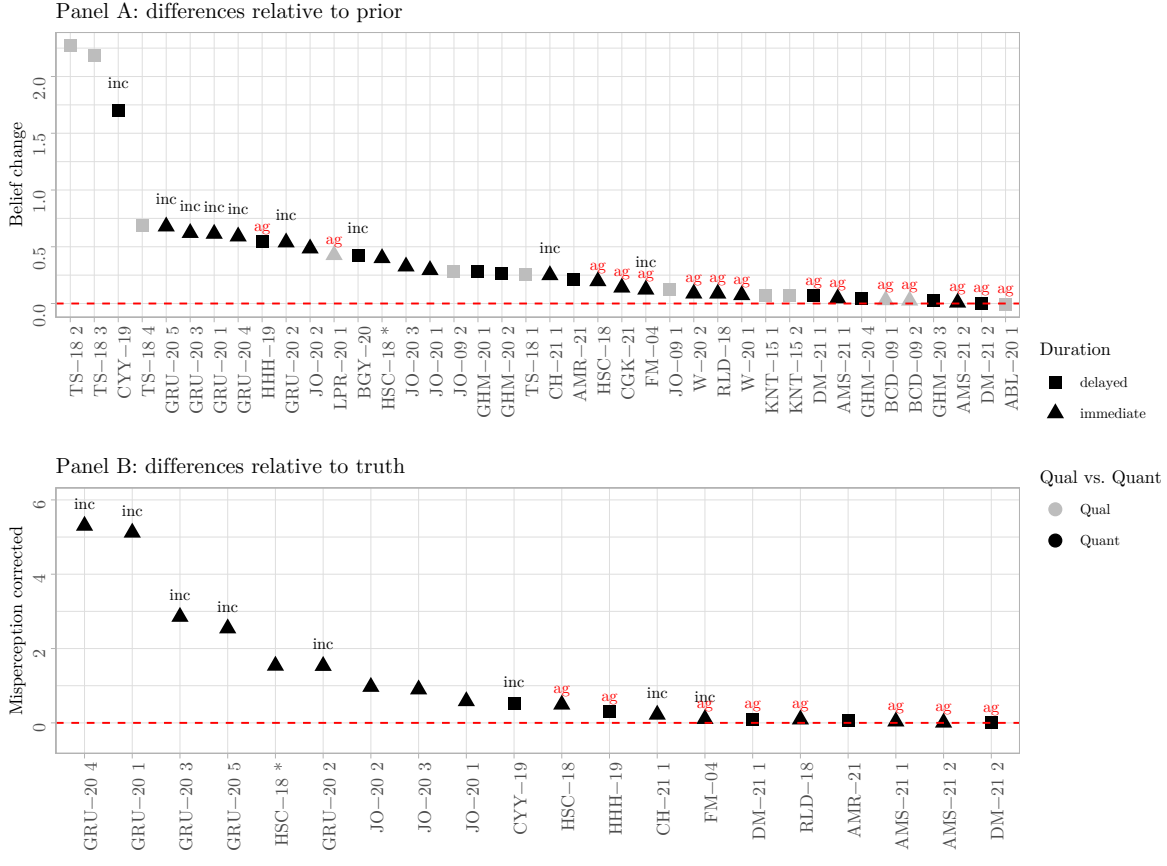
Can experimental treatments effectively change respondents' perceptions about others? To measure changes in beliefs due to the experimental treatments across papers, we develop a metric to measure relative belief changes. We standardize the beliefs to the same scale (0-100), then calculate the differences between posterior beliefs and prior beliefs, relative to the level of prior beliefs. We carry out this calculation within-subject when experimental design allows for such analysis, and across-subject between treatment and control group if otherwise. We re-order the directions in which changes in beliefs take place, so that positive changes can be interpreted as successful beliefs movements towards the intended directions across papers. For example, if in a study where respondents are overestimating in their beliefs about others, and a treatment is assigned to move respondents closer to the truth and thus posterior beliefs are moved downward, we flip the sign of belief changes — a relative change of 0.5 in this case would indicate that posterior beliefs have shifted downward by 50% relative to the level of prior beliefs.

When studies in addition measure the truth of perceptions about others, we develop a second measure of treatment effects of beliefs changes based on belief convergence towards the truth. Similar to the first measure, we carry out this calculation within-subject when possible, and across-subject otherwise. In order to homogenize such measure across papers, we again turn this to a relative measure, and positive numbers always indicate belief movements toward the truth. For example, a 50% convergence to the truth indicates that the treatment induces the treated subjects to update their perceptions about others (relative to their priors when relevant) half way towards the truth.

Figure 6, Panel A, plots the experimental treatment effects on changes in perceptions relative to the perceptions held prior to the treatment; and Panel B plots the treatment effects on changes in perceptions relative to truth in the corresponding dimensions (see Appendix Figure A.9 for treatment effects on both primary and secondary beliefs elicited in the studies). One observes that for all papers except for one, experimental treatments generate changes in respondents' perceptions about others along the intended direction.¹⁰ In other words, treatment in general does not induce backfire in beliefs about others. This stands in contrast with the small but emerging literature that documents cases of backfire in response to explicit attempts to shape individuals' beliefs and attitudes (e.g., Fouka, 2020).

The magnitude of changes in perceptions induced by the experimental treatments varies across papers. In nearly one third of the studies, perceptions about others shifted by more than 50% rel-

¹⁰ Ashraf et al. (2020) is the only study in which treatment generates changes in perceptions toward the opposite direction. This study elicits parents' beliefs about their daughters' abilities when studying how interpersonal skills facilitate intergenerational investment. Among the several beliefs they elicited, parents' assessment of girls' abilities relative to other classmates decreased after a negotiation training program.



"inc" represents 'incentive to guess right', 'ag' represents the statistics are calculated at the aggregate level.

Figure 6: The figure displays the experimental treatment effects on perceptions about others (focused on the primary belief of each paper). Panel A shows belief changes relative to prior beliefs. Positive changes indicate that beliefs move in directions matched with the treatment intentions. Panel B shows the belief changes relative to true beliefs. Duration is “immediate” if the prior and posterior beliefs are elicited in the same round of survey, and “delayed” if the prior and posterior beliefs are elicited in separate surveys with time lags. A treatment is “qualitative” if it is in the form of narrative or training, and “quantitative” if it provides respondents statistics or the access to statistics. The mark “inc” indicates belief elicitation that are incentivized; and the mark “ag” indicates studies where belief changes are calculated at the aggregate level (across-subject). The mark * indicates the effects of a cross-randomized treatment arm on the same outcome that allows for within-person analysis.

ative to the levels of prior beliefs, and around half of the studies find changes in perceptions by 25%. While full convergence to truth is uncommon, in about half of the studies, experimental treatment move treated subjects’ posterior beliefs at least half of the way towards the truth, corresponding to a substantial re-calibration of perceptions about others. In five studies, treatments generate over-correction of beliefs — perceptions about others move too much and resulted in misperceptions in the opposite direction.

It is important to note that levels of aggregation make a significant difference to the identified effect sizes. Studies that exhibit moderate (or even minimal) magnitudes of changes in perceptions are almost entirely concentrated among those that only across-subject comparisons are feasible.

Depending on the distribution of prior beliefs relative to the treatment provided, the aggregate changes in perceptions could appear mechanically small if the treated subjects whose beliefs move upward and those whose beliefs move downward cancel each other out in aggregate; this could be the case even when beliefs may have changed substantially within-subject.¹¹ As shown in Appendix Figure A.10, accounting for beliefs changes in aggregate considerably decreases the treatment effect sizes among the studies that have shown large effects within-subject. Nonetheless, it is also likely changes in perceptions may indeed be moderate in the domains that these studies focus on and the effect sizes would appear small even if belief changes are calculated within-subject. Future studies could help resolve such ambiguity by converging on experimental designs that elicit priors and thus allowing for both within-subject and across-subject comparisons. In the following section, we investigate what may account for the differences in treatment effect magnitudes on re-calibrating beliefs about others.

IV.B Qualitative/narrative treatment tends to have larger effects

We next examine whether the magnitude of treatment effects on perceptions re-calibration depends on the nature of the treatment content.

The experimental treatments in the existing literature typically falls under two broad categories in terms of treatment content. In vast majority of the studies, the treated subjects are provided with direct information about others. The information may be statistical, revealing the true summary statistics on the characteristics and opinions of others. For example, Jørgensen and Osmundsen (2020) provide Danish citizens with correct information about non-Western immigrants' crime rates and welfare dependency rates in order to change their beliefs about non-Western immigrants.

A small number of studies (6 among the studies we examine) feature treatments that are qualitative and narrative in nature. Rather than presenting quantitative information, these treatments aim to influence respondents perceptions about others with narratives, anecdotes, vignettes, or "immersive experiences" such as pair-wise matching, games, and specific training. Among the studies that we examine, Beaman et al. (2009) study how the exposure to female village council leader influence people's perceptions about women's leader effectiveness and their gender-occupation stereotypes; López-Pérez and Ramirez-Zamudio (2020) present the anecdote that the firm of a famous Peruvian Olympic medalist pays its taxes punctually to elicit people's beliefs about the average donations by others; Jensen and Oster (2009) estimate the introduction of cable TV on women's beliefs about their domestic and social status; Ashraf et al. (2020) study how the provision of negotiation training for girls impact parents' beliefs about their daughters' abilities and behaviors; Kendall, Nannicini and Trebbi (2015) inform people of slogans about competence and political stance of the city manager; and Turetsky and Sanderson (2018) engage students into stress management intervention programs to convince them mental health problems on campus

¹¹Coffman, Featherstone and Kessler (2015) demonstrate this point explicitly in a model of information nudges.

are more prevalent than they initially believe.

We distinguish studies using qualitative versus quantitative treatment contents in Figure 6, where darker (lighter) shaded dots indicate effects of studies using quantitative (qualitative) treatments. One observes that studies using qualitative treatment contents tend to generate larger effects on treated respondents' beliefs about others: 3 out of 6 studies that use that type of treatment exhibit above median treatment effect sizes. Moreover, the relatively large effects generated by the qualitative treatments are particularly pronounced if the belief elicitation is delayed, rather than immediately after the experimental treatment or shortly after within the same survey module (distinguished by squares and triangles in Figure 6). This suggests the plausibility of interaction between endogenous memory on information (e.g., Zimmermann 2020) and the nature of the content regarding others.

The patterns described above are inconclusive given the small number of observations, and the lack of cross-randomization on experimental design features — there are differences in many other aspects across studies beyond the qualitative and quantitative content. Hence, in future research, there is ample scope for incorporating qualitative treatments into the experimental design and for precisely identifying the differences between quantitative and qualitative content in shifting beliefs, contributing to the emerging interests in narratives among economists in recent years (e.g. Shiller 2020; Benabou, Falk and Tirole 2020).

IV.C Re-calibrating misperceptions affects behaviors, particularly if immediately after the intervention

Having examined the experimental treatments' effects on re-calibrating respondents' perceptions about others, we now investigate the treatment effects on behaviors.

We focus on behaviors directly associated with the perceptions about others that the treatments are intended to influence — often these behaviors are the primary focus of the study.¹² For example, in Bursztyn, González and Yanagizawa-Drott (2020), the primary behavior of interest is husbands' willingness to sign up their wives for a job service in response to potential changes in beliefs about social norms on women working outside the home; and in Cantoni et al. (2019), the primary behavior is citizens' participation in anti-authoritarian protest in response to potential changes in beliefs about others' protest participation. While many papers examine changes in actual behaviors, either directly observed or self-reported, some papers focus on intended behaviors often elicited immediately after the experimental treatments.

"Persuasion rate," first developed by DellaVigna and Kaplan (2007), provides a standardized measure to compare treatment effects' magnitudes across papers. Specifically, for each paper in-

¹²A number of papers included in this part of the analysis do not elicit (posterior) beliefs about others, but rather, only elicit the corresponding behaviors. For example, Flory, Leibbrandt and List (2015) observe job seekers' application decisions in response to different gender beliefs; and Ferraro and Price (2013) examine residents' water use habits when receiving technical advice and a message that appealed to pro-social preferences in the community.

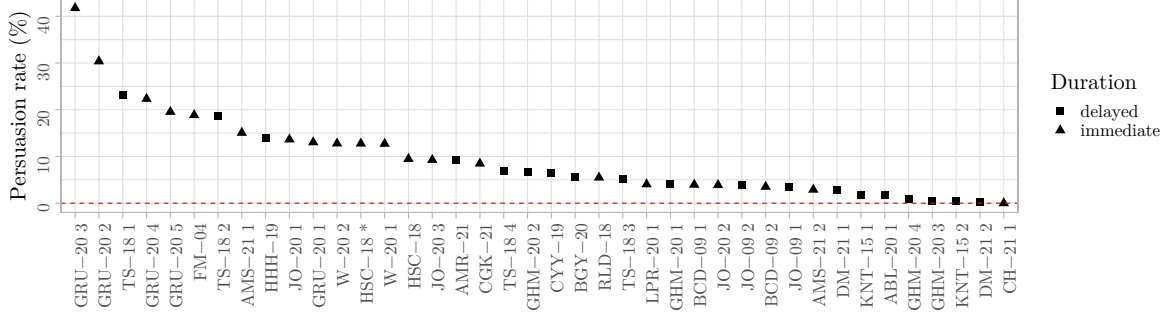


Figure 7: This figure displays the persuasion rates of different treatments. We restrict the samples to the primary beliefs in the studies. Duration is “Immediate” if the prior and posterior beliefs are elicited in the same round of survey, and “Delayed” if the prior and posterior beliefs are elicited in separate surveys. The mark * indicates the treatment effects of a cross-randomized treatment arm on the same outcome.

volving experimental treatment on behaviors, we estimate the following metric:

$$f = 100 \times \frac{y_T - y_C}{e_T - e_C} \frac{1}{1 - y_0},$$

where $y_T - y_C$ is the difference in behavior between treatment and control groups, y_0 is the behavior at the status quo (which is captured by y_C in studies that do not measure behaviors prior to treatment), and $e_T - e_C$ is the difference in the shares of subjects exposed to the treatment between treatment and control groups. Intuitively, this measure captures the changes in behaviors (standardized into binary terms) among those who are exposed to the treatments that re-calibrate perceptions about others. The magnitude of behavioral changes is adjusted based on the proportion of respondents who have not yet adopted the behavior in the status quo (either in the control group, or prior to the treatment interventions), capturing the upper bound of changes in behaviors to be expected to happen.

Figure 7 presents persuasion rates on the primary behaviors elicited across the examined studies (see Appendix Figure A.11 for persuasion rates on the secondary behaviors when multiple behaviors of interests are measured). The persuasion rates of treatments that re-calibrate perceptions about others on corresponding behaviors range from 0 to 50%. Similar to the patterns observed in Section IV.A, all studies examined here exhibit positive persuasion rates, indicating that there is little evidence of behavioral backlash on average. About half of the studies find persuasion rates above 10% — benchmarked against other studies that examine effects of persuasion on political and economic behaviors, such magnitude of persuasion rates is large (see DellaVigna and Gentzkow, 2010 for a review of the empirical persuasion literature).

We next distinguish whether the behavioral outcomes are elicited immediately after the treatment inventions (i.e., in the same survey or experimental module; marked in triangles in Figure 7), or with a time lag (i.e., in different modules that take place after the interventions; marked in squares). One can observe that the vast majority of the studies that document persuasion rates

above 10% focus on behavioral outcomes immediately after the intervention, and many studies examining lagged behavioral outcomes yield moderate or even close to zero persuasion rates.¹³

There are several potential interpretations for this pattern. First, studies differ in many other aspects beyond the immediacy of behavioral outcomes, and very few studies examine changes in behaviors both in short and long run after treatment interventions. For example, behavioral outcomes studied with a time lag are more likely to be in the domain of politics (see Appendix Figure A.13). Second, even if both short and long run behavioral changes are elicited within the same study context, it can be challenging to distinguish whether behaviors are indeed difficult to change especially in the long run, or the changes in perceptions induced by the treatment interventions have eroded over time (e.g., Gerber et al., 2020). Perceptions about others might shift significantly between the time when treatments take place and when behaviors occur, due to reasons such as regression to the mean, biased recall or motivated memory (e.g., Bordalo, Gennaioli and Shleifer 2020). Examining the timing and evolution of beliefs updating about others in response to information shocks, and the dynamics of behavioral changes tracked with belief changes throughout the relevant time frame can be an important direction for future research.

If we take at face value the moderate to minimum behavioral changes with a time lag after the treatment interventions, such magnitude stands in contrast with relatively large effects of experimental treatments on perceptions about others. This would suggest a rigidity in the mapping between (stated) perceptions of others and relevant behaviors. One possibility is that even though stated beliefs may have changed, the deeper underlying drivers of behavior have not. For example, consider someone who is opposed to an out-group (e.g., immigrants). That person may have originally incorrectly believed that immigrants commit crimes at a very high rate. Correcting this misperception might affect this particular belief. However, the person may decide to rely on a different set of incorrect beliefs (e.g., immigrants “steal” jobs) to maintain their negative views on and behaviors toward immigrants. Understanding the ultimate source of misperceptions (such as motivated beliefs) and the extent to which misperception correction may spill over to other beliefs are important avenues for future research that can help understand the potential for informational interventions to affect behaviors beyond the immediate short run.

V Conclusion and Looking Ahead

In recent years, a growing number of papers have examined the causes and consequences of misperceptions about others in the field. In this review, we survey this literature and document six stylized facts concerning the patterns of misperceptions about others and re-calibrating such misperceptions using experimental treatments.

Many open questions remain. We now describe several important directions for future re-

¹³Appendix Figure A.12 also distinguish the persuasion rates based on whether the studies feature within-subject or across-subject treatment design, and whether the treatments are qualitative or quantitative in nature.

search. First, more work is needed to explicitly identify the sources of misperceptions. There are many more studies that investigate beliefs about others in laboratory environments, and it would be a fruitful effort to map these beliefs into field context. Extending the examination of beliefs about others in a broader range of domains would also inform us about whether misperceptions are omnipresent, or if there exists areas in which perceptions about others are well-calibrated. This could be shed light on the reasons why misperceptions emerge. Moreover, theoretically grounded investigations on the sources of misperceptions would have great value — for example, studies that incorporate designs that explicitly rule in and rule out existing theories. The patterns that we document may also generate additional theoretical frameworks to understand the origin of misperceptions — for example, models that generate asymmetry in misperceptions or models that explicitly incorporate supply-side factors could be promising to account for a number of regularities of beliefs documented in the literature.

Second, more work is needed to understand the different ways in which misperceptions can be re-calibrated, and under what conditions such re-calibrated misperception may actually lead to behavioral changes. Investigations on the sources of misperception more grounded in theory could inform us about the elasticities of such misperception with respect to treatments of various nature. Systematically comparing different treatment designs (e.g., quantitative vs. narrative content) to correct misperceptions would greatly enhance our understanding of misperceptions in general. Moreover, to the extent that belief updating itself cannot re-calibrate the deeper underlying factors that drive misperceptions in the first place, treatments of very different nature may be needed to induce behavioral changes. For example, would providing opportunities to guide reasoning and improve empathy be a more powerful tool to re-calibrate misperceptions about others?

We also note that much of the existing work does not explore the dynamics and the evolution of both belief changes and behavioral responses. This would be an important avenue for future research, since mechanisms such as selective memory and attribution errors may interact with the largely cross-sectional patterns of misperceptions that the literature has documented thus far. For example, is quantitative information provided to respondents more easily forgotten than qualitative narratives? Is memory about perceptions about others motivated (e.g., à la beliefs about oneself as documented by Zimmermann 2020)? Do people seek biased information along their original priors, after the experimental treatment has re-calibrated their beliefs?

Third, an important direction for future research is to consider the welfare implications of widespread misperceptions and of their correction. One such normative consideration — which is out of the scope of the existing literature — is to examine whether informing people about the true state of the world to re-calibrate perceptions about others is always desirable. To the extent that authoritarian regimes may manage to sustain political control via manipulation of citizens' perceptions of each other (e.g., Kuran 1997), would policies that induce certain perceptions about others be able to generate political changes that expand political rights and freedom to more peo-

ple in the world? To the extent that misperception might be self-fulfilling, can policy be designed to “engineer” misperceptions that lead to more socially desirable outcomes (e.g., in the contexts of racial tolerance and gender equality)?

We look forward to the exciting future research that extends this literature and answers some of these open questions.

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A APPENDIX

Table A.1: Overview of papers covered in meta-analyses (detailed)

Label	Paper	Context	N	Primary beliefs	Treatment
A-14	Ahler (2014)	voters in California	2,444	partisan differences in political opinions	no
ABL-20	Ashraf et al. (2020)	parents in Zambia	3,146	daughter's ability and behavior	yes
AMR-21	Yang et al. (2021)	households in Mozambique	2,412	support for social distancing during COVID-19 pandemic	yes
AMS-18	Alesina, Miano and Stantcheva (2018)	non-immigrants in European countries and US	4,378	immigrants' characteristics	yes
AMS-21	Ayalew, Manian and Sheth (2021)	university staff members in Ethiopia	304	female and male leader's ability	yes
AR-21	Anders and Rafkin (2021)	US representative sample	2,131	stigma about food stamps	yes
AS-18	Ahler and Sood (2018)	a sample of US population	1,000	party-stereotypical characteristics	no
BC-12	Bursztyn and Coffman (2012)	poor families in Brazil	210	high school and college graduate wages	no
BCG-16	Bordalo et al. (2016)	self-identified liberals and conservatives in the US	2,000	partisan differences in political opinions	no
BFP-18	Bernhardt et al. (2018)	married couples in India	3,815	gender norms on women working	no
BGY-20	Bursztyn, González and Yanagizawa-Drott (2020)	married young men in Saudi Arabia	500	women working outside of home	yes
BLP-20	Bergolo et al. (2020)	taxpayers in Uruguay	6,078	tax evasion behavior	no
BPT-20	Bottan and Perez-Truglia (2020)	senior medical students in the US	1,080	position in the income distribution	yes
BS-18	Broockman and Skovron (2018)	state legislative candidates in the US	1,803	public opinion about political issues	no
BTY-20	Bordalo, Tabellini and Yang (2020)	self-identified liberals and conservatives in the US	10,500	partisan differences in political opinions	no
CGK-21	Coibion et al. (2021)	firm managers in New Zealand	1,032	inflation expectations	yes
CH-21	Carlson and Hill (2021)	US representative sample	3,253	probability for voting for Trump	yes
CPT-13	Cruces, Perez-Truglia and Tetaz (2013)	households in Argentina	1,100	share of low income population	no
CPT-18	Cullen and Perez-Truglia (2018)	employees at a Southeast Asian corporation	2,060	peers' and manager's salary	no
CYY-17	Cantoni et al. (2017)	students at an university in Hong Kong	5,160	anti-authoritarian attitudes	no
CYY-19	Cantoni et al. (2019)	students at an university in Hong Kong	1,234	protest participations	yes
DM-21	Drouvelis and Marx (2021)	US sample	382	donations	yes

Label	Paper	Context	N	Primary beliefs	Treatment
DR-19	Dizon-Ross (2019)	households in Malawi	2,634	child's school performance	yes
F-18	Fedyk (2021)	students at an university in California	57	present bias	no
FHW-15	Fearon, Humphreys and Weinstein (2015)	a sample of villagers in Liberia	1,992	project contribution	yes
FM-04	Frey and Meier (2004)	university students in Switzerland	2,500	donations	yes
FMP-19	Fehr, Mollerstrom and Perez-Truglia (2019)	Germany representative sample	1,392	position in the income distribution	yes
GHM-20	Gerber et al. (2020)	US representative sample	6,705	closeness of elections, voting for Democratic or Republican governor	yes
GNH-12	Graham, Nosek and Haidt (2012)	US online sample	1,001	partisan moral values	no
GRU-20	Grigorieff, Roth and Ubfal (2020)	US online sample	1,193	immigrants' characteristics	yes
HFM-19	Hertel-Fernandez, Mildemberger and Stokes (2019)	senior legislative staff in the US	101	constituents' political opinions	yes
HHH-19	Hager et al. (2019)	party supporters in a Western European country	1,411	canvassing behavior during election campaign	yes
HNO-20	Holm, Nee and Oppen (2020)	CEOs and non-CEOs in China	400	CEOs' and non-CEOs' strategic decisions	yes
HSC-18	Hopkins, Sides and Citrin (2018)	non-Hispanic Americans	7,558	size of immigrant population	yes
JO-09	Jensen (2010)	women in five Indian states	9,159	women's status: acceptability of husband beating his wife	yes
JO-20	Jørgensen and Osmundsen (2020)	Denmark representative sample	1,638	immigrant's characteristics	yes
K-21	Karing (2021)	parents in Sierra Leone	1,314	child vaccination	yes
KNT-15	Kendall, Nannicini and Trebbi (2015)	voters in Italy	1,455	politicians' ideology and competence	yes
KP-21	Kinsler and Pavan (2021)	US representative sample of parents	21,409	child's skills reading and math skills	no
LM-16	Levendusky and Malhotra (2016)	US representative sample	510	partisan differences in political opinions	no
LMB-13	Lapinski et al. (2013)	male students at a US university	80	hand washing behavior	yes
LPR-20	López-Pérez and Ramirez-Zamudio (2020)	taxpayers in Peru	156	donation	yes
LS-14	Lawrence and Sides (2014)	US sample	1,000	population characteristics	yes

Label	Paper	Context	N	Primary beliefs	Treatment
MT-19	Mildenberger and Tingley (2019)	Chinese and US samples	3,474	climate change: beliefs and policy opinions	no
N-18	Nair (2018)	US representative sample	2,690	global income distribution	yes
RF-18	Rogers and Feller (2018)	high-risk students in the US	34,461	child's school absences	yes
RLD-18	Robinson et al. (2018)	parents in school districts on the US West Coast	10,967	child's school absences	yes
TS-18	Turetsky and Sanderson (2018)	students at a US university	520	students' mental health	yes
W-20	Williamson (2020)	US representative sample	3,267	Muslims' patriotism; attitudes towards Muslims	yes
WZ-15	Wiswall and Zafar (2015)	students at a US university	501	income depending on gender and college major	yes
Y-19	Yu (2019)	Mozambique representative sample	1,588	HIV stigma	yes

Table A.2: Overview of papers on perceptions about others not included in the meta-analyses

Label	Paper	Context	N	Primary beliefs	Treatment
B-20	Bergman (2020)	low-income area students in Los Angeles	306	child's effort in school	yes
BBK-13	Balafoutas et al. (2013)	taxi drivers in Athens, Greece	124	taxi drivers' behavior	no
BCD-09	Beaman et al. (2009)	males and females in West Bengal, India	13,210	womens' leader effectiveness and gender-occupation stereotypes	yes
BGH-15	Bullock et al. (2015)	US tax payers	216	approval of president Bush	yes
C-17	Cavaille (2017)	European representative sample	30,142	free-riding behavior	no
C-19	Carlana (2019)	middle schools teachers in Italiy	1,400	difference in gender ability	no
CAG-14	Cassar, d'Adda and Grosjean (2014)	individuals in Italy and Kosovo	346	others' trustworthiness	yes
CBI-06	Chambers, Baron and Inman (2006)	psychology students at University of Iowa	287	partisan differences in political opinions	no
CM-06	Chambers and Melnyk (2006)	psychology students at University of Florida	927	partisan differences in political opinions	no
DH-14	Distelhorst and Hou (2014)	local officials in China	258	ethnicities' characteristics	yes
ETW-14	Ewens, Tomlin and Wang (2014)	landlords in the US posting on Craigslist	14,237	renters' quality based on race	no
FLL-15	Flory, Leibbrandt and List (2015)	respondents to job advertisements in the US	8,969	potential future coworkers' and boss's gender	yes
FP-13	Ferraro and Price (2013)	households in Cobb County, Georgia	11,600	other households' water use	yes
FS-00	Frank and Schulze (2000)	students at University of Hohenheim, Germany	161	others' corruptibility	no
GP-13	García-Pérez (2013)	US sample	91,682	child's health	no
HHH-20	Hager et al. (2020)	party supporters in a Western European country	1,417	canvassing behavior	yes
HKS-20	Hvidberg, Kreiner and Stantcheva (2020)	Denmark representative sample for birth years 1969-1973	9,415	income distribution	yes
HR-21	Haaland and Roth (2021)	US representative sample	1,382	racial labor market discriminations	yes
K-20	Koutout (2020)	workers with interest or experience in sales occupation	4,882	managers' beliefs about females' and males' productivity	yes
KQJ-20	Kuklinski et al. (2000)	resentative sample of Illinois	1,160	people on welfare	yes

Label	Paper	Context	N	Primary beliefs	Treatment
M-15	Mukherjee (2017)	parents and adolescents in Rajasthan, India	898	child's future outcomes depending on gender and caste	yes
OP-13	Ouazad and Page (2013)	British students	1,200	teachers' discrimination in grading	yes
R-18	Reyes (2018)	participants in a CCT program in Cartagena, Colombia	714	others' cooperation behavior in CCT programs	yes
SKH-18	Sabarwal, Kacker and Habyarimana (2018)	secondary school teachers in Uganda	350	teachers' ability, effort, satisfaction	no
SW-21	Schindler and Westcott (2021)	troops stationed in Britain	2,699	English people's opinion of Americans	yes
TC-16	Tanaka and Camerer (2016)	multi-ethnic villages in Mekong Delta, Vietnam	334	ethnic groups' characteristics	no
W-05	Wenzel (2005)	Australian taxpayers	1,500	acceptance of tax evasion	yes
YAM-21	Yang et al. (2021)	households in Mozambique	3,658	HIV stigma	yes

Table A.3: Papers and beliefs by topic

Domain	Papers	Beliefs
politics	15	191
socioeconomic	14	40
education	7	20
gender	5	10
health	5	16
immigration	5	25
Total	51	302

Table A.4: Papers and beliefs by type

Type	Papers	Beliefs
actions	18	41
characteristics	17	76
opinions	16	185
Total	51	302

Table A.5: Papers and beliefs by target

Group	Papers	Beliefs
in-group	23	124
out-group	17	149
general	11	29
Total	51	302

Table A.6: Papers and beliefs by incentives

Incentivized	Papers	Beliefs
no	37	238
yes	14	64
Total	51	302

Table A.7: Papers and beliefs by unit

Share vs absolute	Papers	Beliefs
share	27	120
absolute	23	179
binary	1	3
Total	51	302

Table A.8: Papers and beliefs by treatment

Treatment	Papers	Beliefs
information treatment	34	115
no treatment	11	156
other treatment	6	31
Total	51	302

Table A.9: Papers and beliefs by belief elicitation

Beliefs	Papers	Beliefs
prior and posterior beliefs	21	59
prior beliefs	18	206
posterior beliefs	12	37
Total	51	302

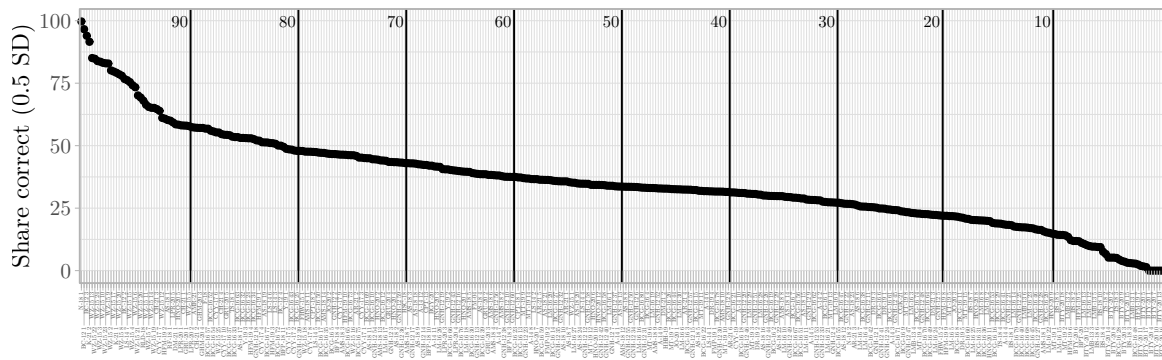


Figure A.1: The figure replicates Figure 1, but is not limited to the primary components of the meta-analysis. It shows the distribution of misperceptions across papers. We measure misperceptions as the share of perceptions within 0.5 SD of the truth. Vertical lines indicate deciles.

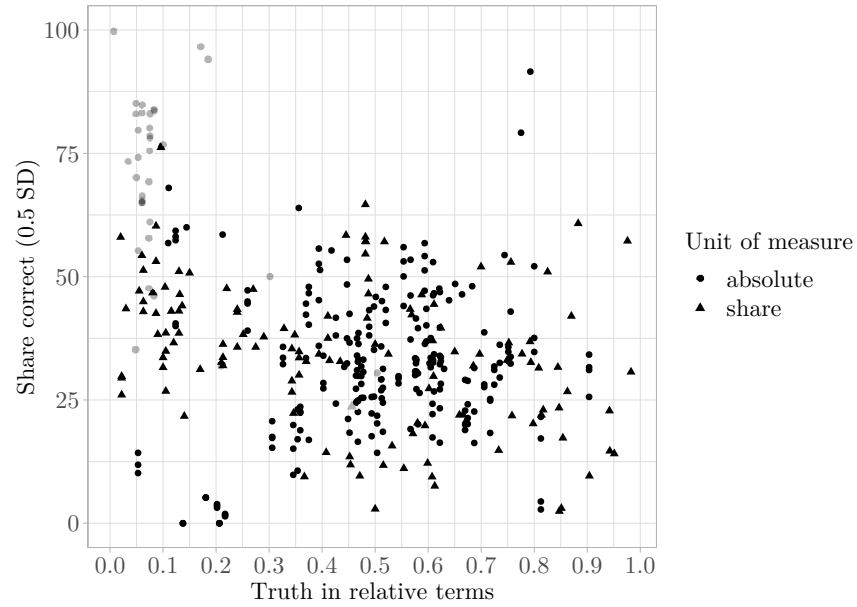


Figure A.2: The figure replicates Figure 2, but is not limited to the primary components of the meta-analysis. It shows the share of correct perceptions (allowing for 0.5 SD around the truth) and the truth in relative terms. For perceptions with an infinite range of possible values, we restrict the scale by defining a reasonable maximum (i.e., the maximum reported perception that is not clearly an outlier) — these beliefs are represented by the grey dots.

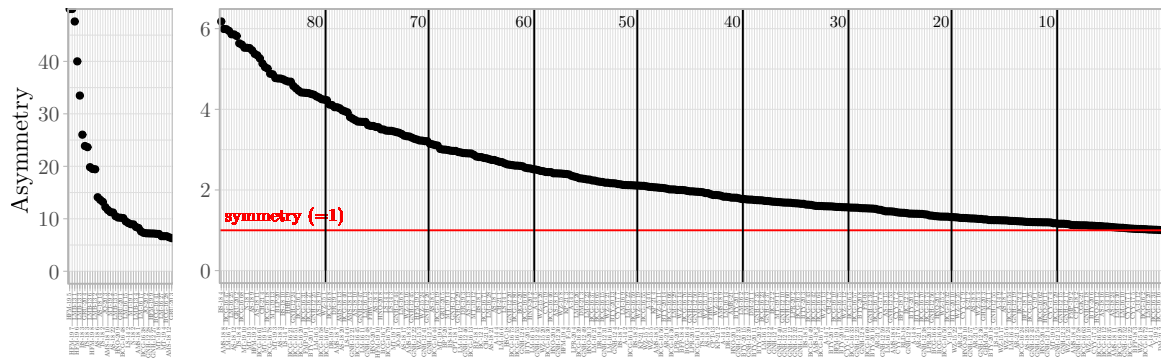


Figure A.3: The figure replicates Figure 3, but is not limited to the primary components of the meta-analysis. It shows the distribution of asymmetry across papers. Asymmetry is defined as the ration of underestimates to overestimates using the larger share as the numerator and the smaller share as the denominator. Vertical lines indicate deciles.

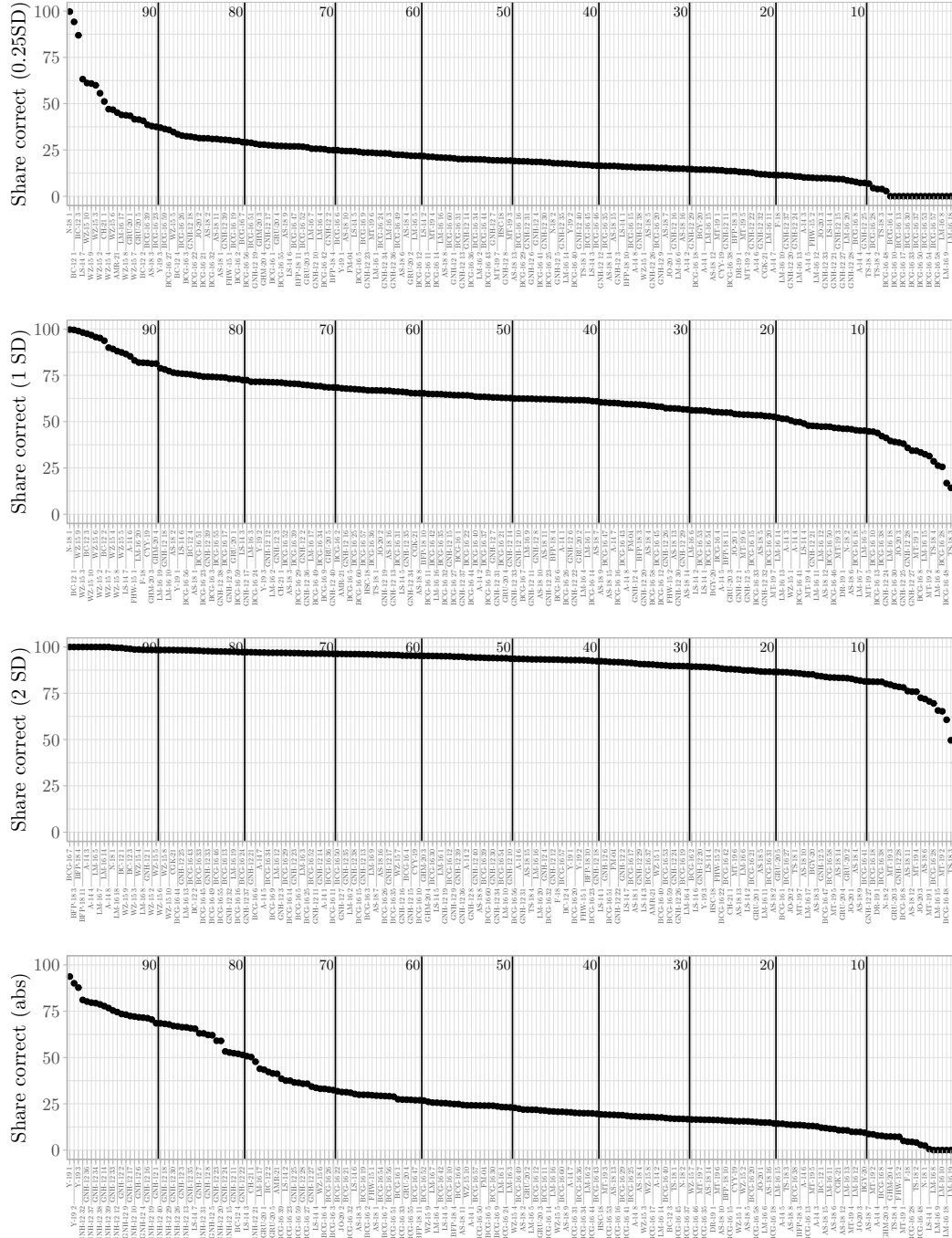


Figure A.4: The figure replicates Figure 1 and shows the distribution of misperceptions, but it allows for different definitions of correct perceptions. We define the different ranges based on the standard deviation of the beliefs, i.e., 0.25 SD, 1 SD, and 2 SD. Additionally, we define a range around the truth based on the absolute value of the truth. The absolute range is defined as follows: ± 5 percentage points for beliefs about percentages (except for beliefs about inflation rate: ± 0.5 percentage points), ± 0.5 points for political opinions measured on a scale from 1-7, ± 250 for beliefs about income with a truth of 904 and 1844, ± 500 for income with a truth of 2100, ± 5000 for income with a truth between 35,000 and 82,000, and ± 5 points for educational performance on a scale from 0-100. The sample for 0.25 SD is equal to the sample of Figure 1, the other figures only include papers for which we found replication data.

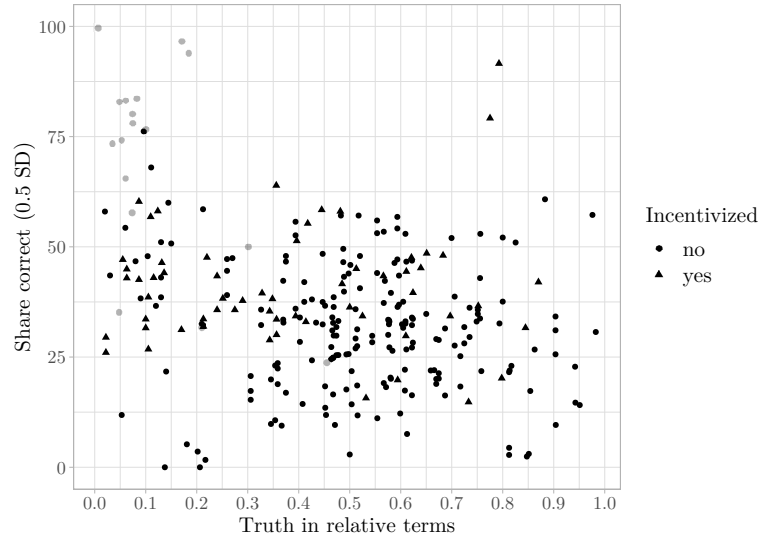
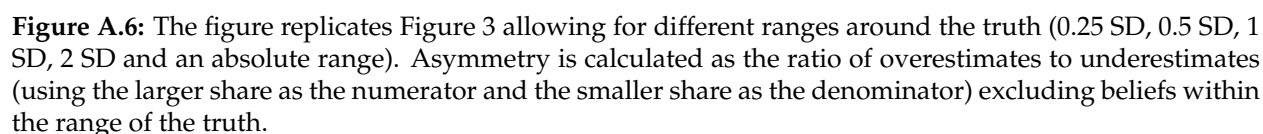


Figure A.5: This figure shows the share of correct perceptions (allowing for 0.5 SD around the truth) and the truth in relative terms. For perceptions with an infinite range of possible values, we restrict the scale by defining a reasonable maximum (i.e., the maximum reported perception that is not clearly an outlier) — these beliefs are represented by the grey dots.



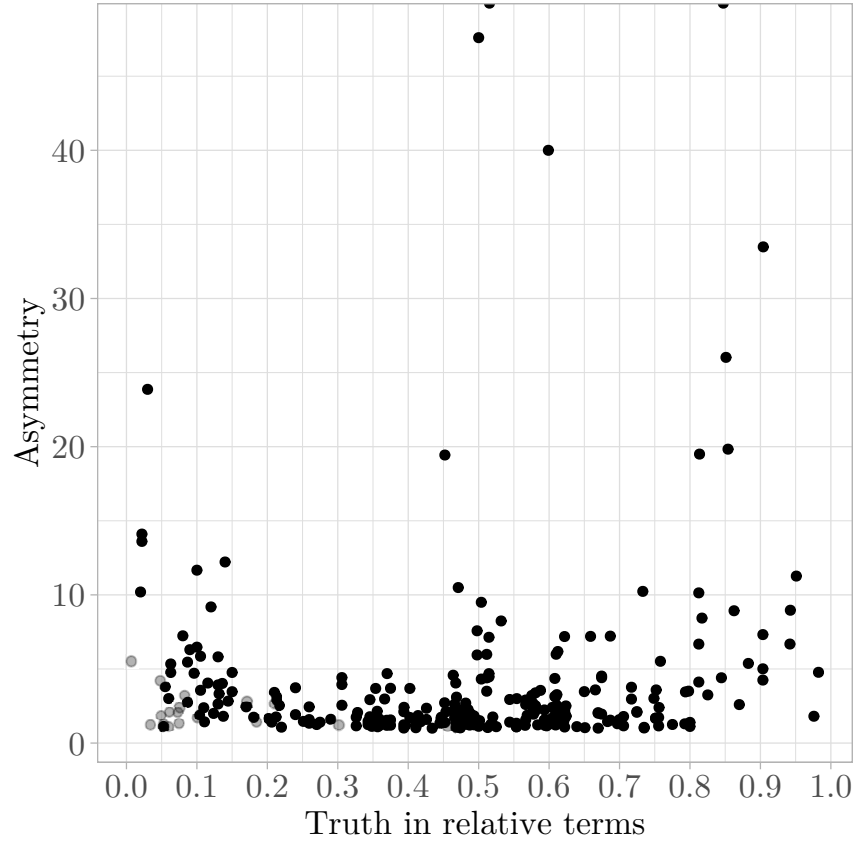


Figure A.7: The figure shows asymmetry (defined as the ratio of respondents on one side of the truth to respondents on the other side) and the truth in relative terms. The truth in relative terms is a non-transformed measure for perceptions measured as shares (e.g. percentage of people supporting a certain policy). For perceptions measured on an absolute scale, we transform the scale to a relative scale (e.g. if the truth for agreement with a statement on a scale from 1 to 7 is 4, this equal to 0.5 in relative terms). For perceptions with an infinite range of possible values, we restrict the scale by defining a reasonable maximum (i.e. the maximum reported perception that is not clearly an outlier). These beliefs are represented by the grey dots in the figure.

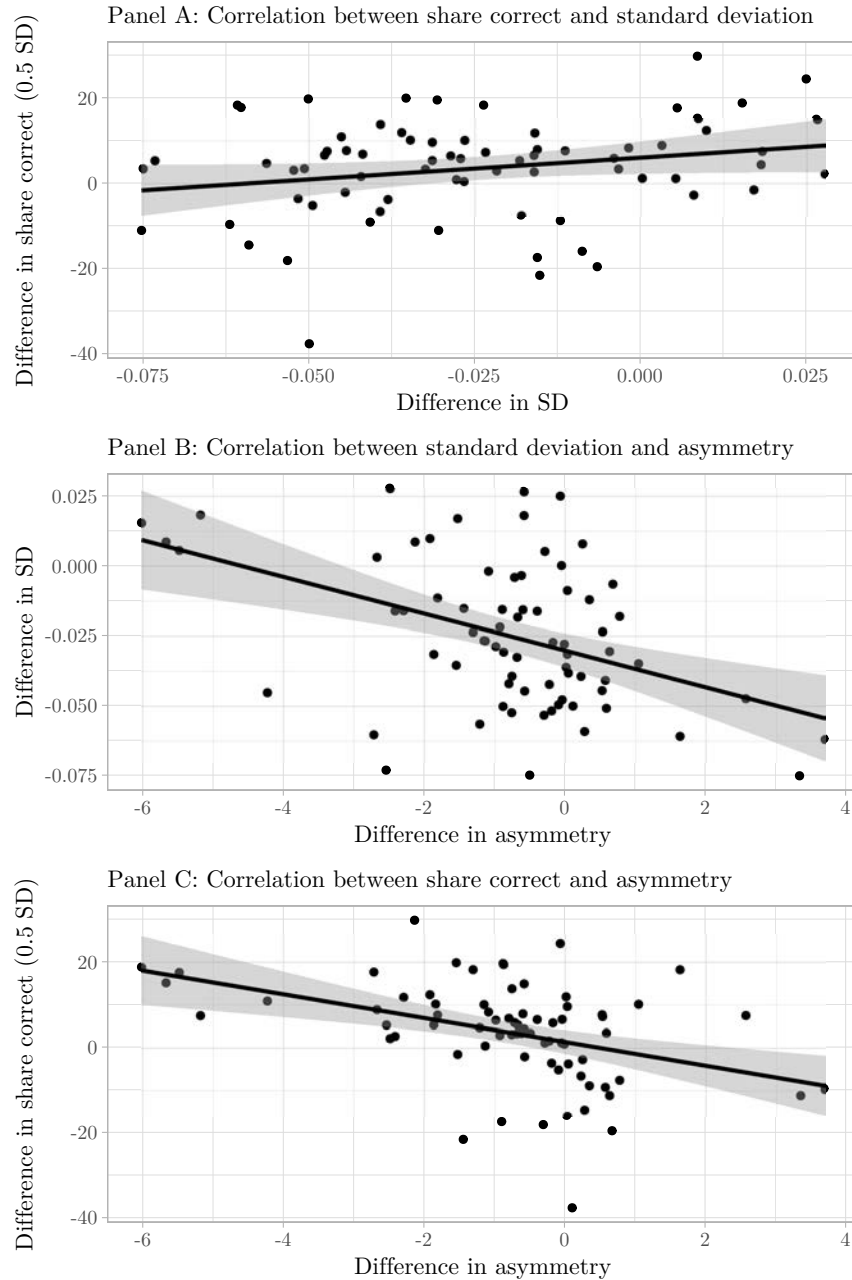
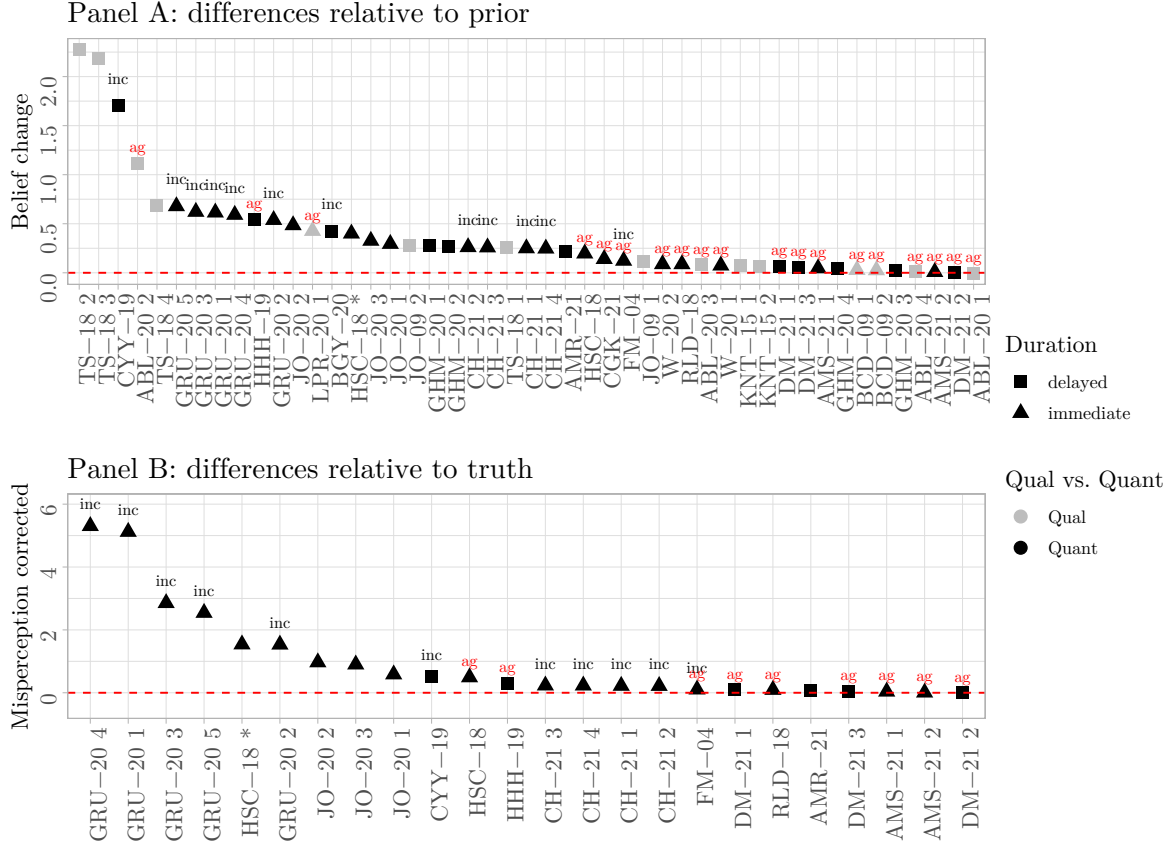
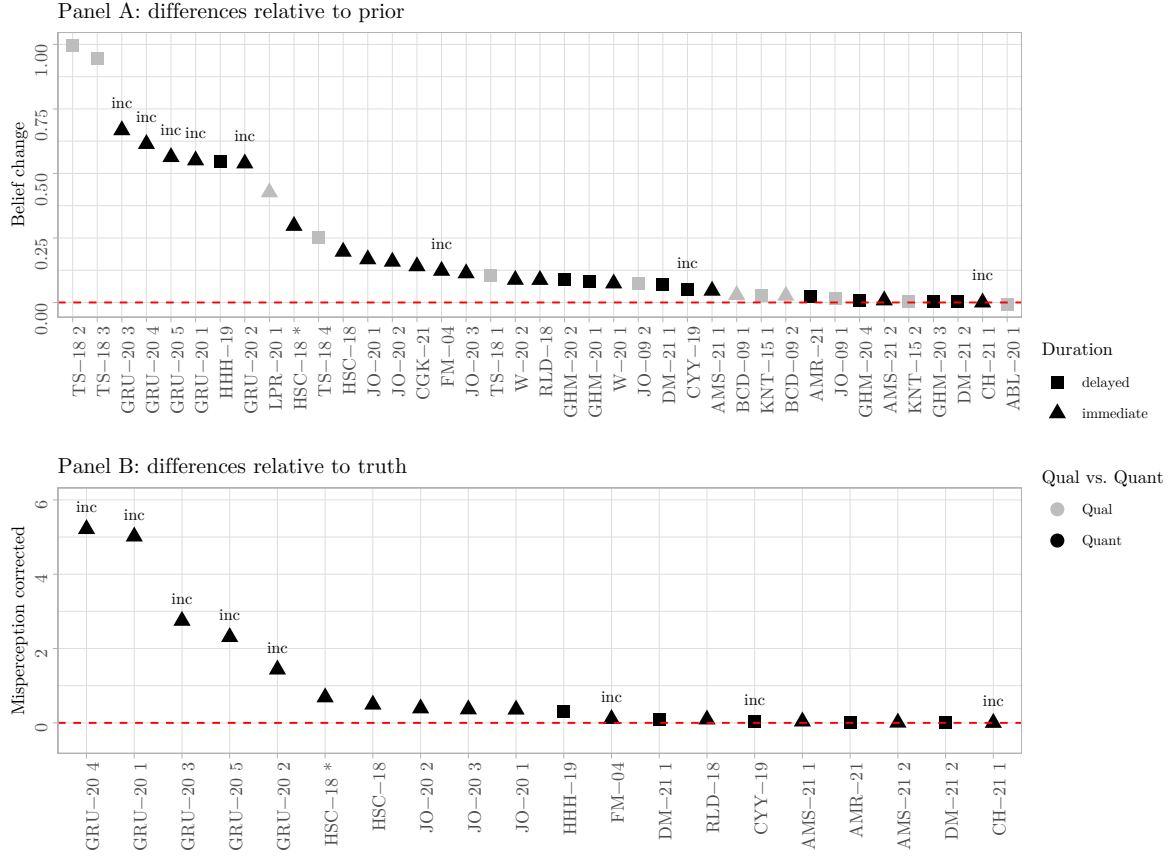


Figure A.8: The figure shows the correlations between in-group/out-group differences of share of correct beliefs within 0.5 SD and standard deviation (Panel A), standard deviation and asymmetry (Panel B), and share of correct beliefs within 0.5 SD and asymmetry (Panel C).



"inc" represents 'incentive to guess right', 'ag' represents the statistics are calculated at the aggregate level.

Figure A.9: The figure displays the belief changes at the individual level and at the aggregate level after imposing treatments of the full sample. Panel A shows the belief changes relative to prior beliefs. We sort the beliefs by the absolute differences between posterior and priors relative to priors and whether the posterior beliefs are moved in the intentional direction. Belief changes above 0 indicate that belief change directions match the intentional direction. Panel B shows the belief changes relative to true beliefs (which can be regarded as the percentage of misperceptions being corrected by treatments). We sort the beliefs by magnitudes of corrected misperceptions. Duration is "Immediate" if the prior and posterior beliefs are elicited in the same round of survey, and "Delayed" if the prior and posterior beliefs are elicited in separate surveys. A treatment is "Qualitative" if it is in the form of narrative or training, and "Quantitative" if it provides respondents statistics or the access to statistics. The mark "inc" is added to beliefs when the respondents are incentivized to guess right about others, and the mark "ag" is added to beliefs when the belief changes are calculated at the aggregate level. The mark "*" on the belief label indicates that the belief is elicited under a different treatment.



"inc" represents 'incentive to guess right'.

Figure A.10: The figure displays the belief changes at the aggregate level after imposing treatments of the primary beliefs. Panel A shows the belief changes relative to prior beliefs. Belief changes above 0 indicate that belief change directions match the intentional direction. Panel B shows the belief changes relative to true beliefs (which can be regarded as the percentage of misperceptions being corrected by treatments). Duration is “Immediate” if the prior and posterior beliefs are elicited in the same round of survey, and “delayed” if the prior and posterior beliefs are elicited in separate surveys. A treatment is “qualitative” if it is in the form of narrative or training, and “quantitative” if it provides respondents statistics or the access to statistics. The mark “inc” is added to beliefs when the respondents are incentivized to guess right about others. The mark “*” on the belief label indicates that the belief is elicited under a different treatment.

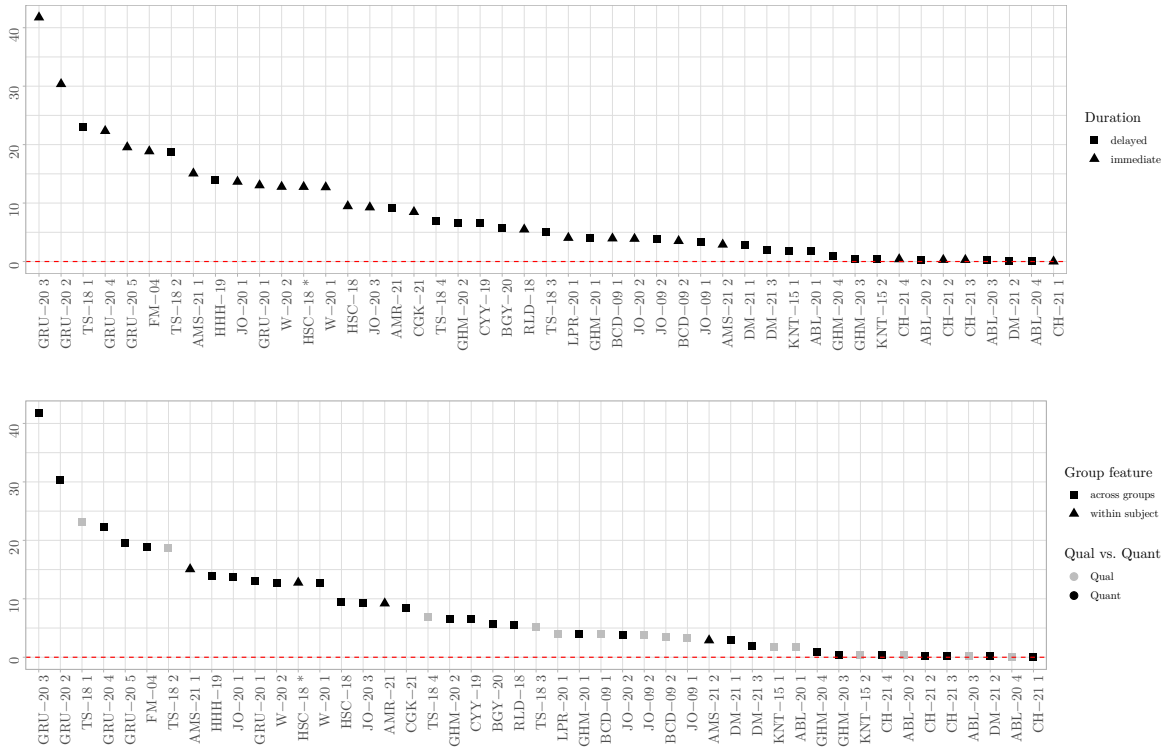


Figure A.11: This figure displays the persuasion rates of different treatments of the full sample. Duration is “Immediate” if the prior and posterior beliefs are elicited in the same round of survey, and “Delayed” if the prior and posterior beliefs are elicited in separate surveys. A treatment is “Qualitative” if it is in the form of narrative or training, and “Quantitative” if it provides respondents statistics or the access to statistics. Beliefs are elicited “Across groups” if the studies specify treatment groups and control groups, and “Within subject” if the prior and posterior beliefs are elicited from the same group of subjects. The mark “*” on the belief label indicates that the belief is elicited under a different treatment.

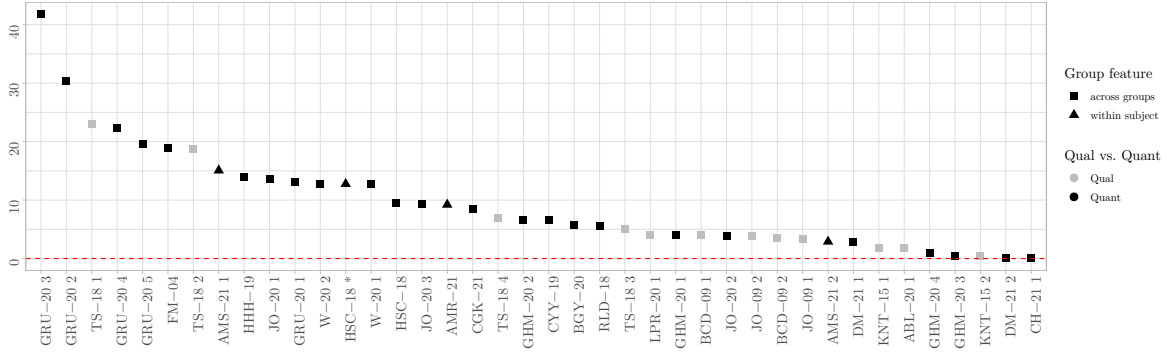


Figure A.12: This figure displays the persuasion rates of different treatments. We restrict the samples to the primary beliefs in the studies. A treatment is “Qualitative” if it is in the form of narrative or training, and “Quantitative” if it provides respondents statistics or the access to statistics. Beliefs are elicited “Across groups” if the studies specify treatment groups and control groups, and “Within subject” if the prior and posterior beliefs are elicited from the same group of subjects. The mark “*” on the belief label indicates that the belief is elicited under a different treatment.

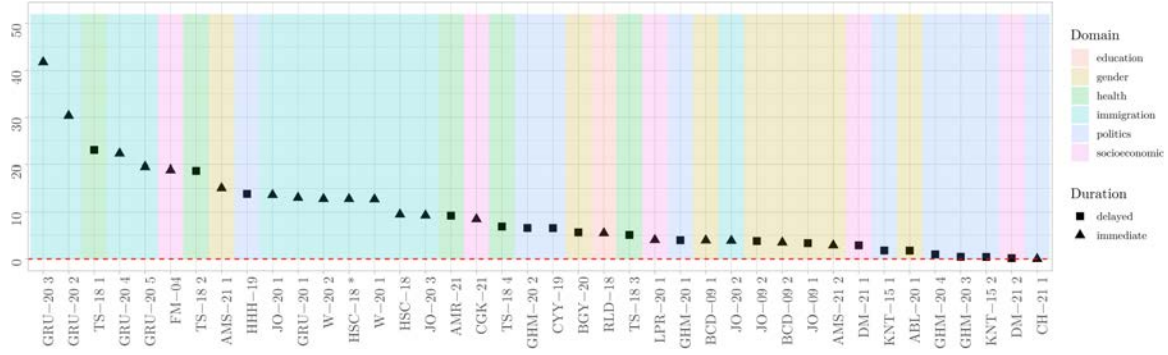


Figure A.13: This figure presents the persuasion rates of papers in different domains. We restrict the samples to the primary beliefs in the studies. All the papers are categorized into 6 domains (education, gender, health, immigration, politics and socioeconomic) based on their subjects. The mark “*” on the belief label indicates that the belief is elicited under a different treatment.